29 Palms Laboratory

Quality Assurance Plan

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Document No.:	QAP – 03 – 05 – 99 – 057
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Revision History

Version	*Date*	*Revision Highlights*
1.0	12-26-97	The original version of the 29 Palms quality assurance plan.
2.0	03-05-99	A major rewrite of the 29 Palms quality assurance plan.
2.1	10-25-99	The 29 Palms Laboratory Organization Chart was updated. The resume of the quality assurance officer was revised.
2.2	12-15-99	Revisions were written to address comments from Dr. David Taylor, Senior Chemist, Quality Assurance Management Section PMD-3), U.S. EPA Region 9.
2.3	9-15-00	Revisions were written to reflect laboratory personnel and floor plan changes.

1. Introduction

The *29 Palms Laboratory* is a non-profit environmental analytical laboratory owned and operated by the Twenty-Nine Palms Band of Mission Indians. Located in southern California just west of the Salton Sea, the goal of the laboratory is to provide Indian and non-Indian communities with the most reliable and highest quality environmental technical services possible. Every effort is made to meet all the data and program objectives of our clients in a timely and cost effective manner. This includes meeting strict data quality standards of local, state, federal, and tribal regulatory agencies. The laboratory is certified as an environmental testing laboratory under the State of California environmental laboratory accreditation program (ELAP). Besides providing analytical testing services, the laboratory also offers technical consulting services such as: interpreting environmental data; performing environmental assessments and surveys; developing and reviewing quality assurance program plans; and implementing procedures and providing training for sampling programs. All proceeds from services rendered will be used to further develop and sustain Tribal environmental programs.

2. Laboratory Quality Assurance Plan (QAP)

This QAP covers the general quality assurance policy of the *29 Palms Laboratory*, which is committed to quality management principles and practices. These policies are based on the national consensus standard and guidelines, ANSI/ASQC E4-1994, and ISO 9000 Series, respectively. Although not all work performed by the laboratory is on behalf of the EPA, this QAP was developed in response to EPA Order 5360.1 CHG 1 and follows the requirements in EPA QA/R2. All work at the *29 Palms Laboratory* is conducted under this QAP. For each individual project, a quality assurance project plan (QAPP) describing more specific QA issues will be developed in consultation with the client. This will ensure that the services provided by the *29 Palms Laboratory* are of the highest quality and at the same time meet the specific needs of our clients.

2.1 QAP objective

The objective of this QAP is to establish an effective and efficient quality management system that will ensure that the data generated by the *29 Palms Laboratory* are accurate, reliable, scientifically valid and legally defensible.

2.2 QAP approval

The Laboratory Director is responsible for preparing the QAP. After review and approval by laboratory management, the QAP is incorporated as a laboratory control document and is distributed to appropriate laboratory personnel. The cover page of the QAP has the approval signatures of the Laboratory Quality Assurance Director and the Laboratory Director. The QAP will be reviewed annually and revisions are

made to ensure its effectiveness. A document name, version number, revision date, and page number are shown on the cover page as well as on each page.

2.3 Activities of QAP

In order to accomplish the QAP objective, the following activities are incorporated:

2.3.1 Ensure that sample integrity is maintained.
2.3.2 Maintain data integrity, validity, and usability.
2.3.3 Document all aspects of the measurement process in order to provide data that are technically sound and legally defensible.
2.3.4 Ensure that the precision and accuracy of the data are known and acceptable based on currently available methodologies.
2.3.5 Ensure that analytical measurement systems are maintained in an acceptable state of stability and reproducibility.
2.3.6 Detect problems through data assessment and establish corrective action procedures to keep the analytical process reliable.
2.3.7 Continue to fulfill the requirements of the California environmental laboratory accreditation program, which includes participation in proficiency testing, on site audits, and other quality evaluation procedures.
2.3.8 Meet EPA quality assurance requirements for performing environmental measurements on their behalf.

2.4 Basic elements of QAP

The QA plan consists of the following three basic elements:

2.4.1 Prevention
2.4.1.1 Prevention requires an orderly program of planning and positive actions before or during analyses to ensure that analytical systems are functioning properly.

2.4.2 Assessment
2.4.2.1 Assessment is a form of control that includes periodic checks on performance to determine precision and accuracy.

2.4.3 Correction
2.4.3.1 Correction is an action taken to determine causes of quality defects and to restore proper functioning of the analytical system.

3. Facilities

3.1 Laboratory facilities

3.1.1 The *29 Palms Laboratory* is an Indian-owned and operated environmental analytical laboratory located at 46-200 Harrison Place, Coachella, California 92236. See map in Appendix *19.1.*

3.1.2 The laboratory is non-profit. All proceeds from analytical services rendered are used to further develop and sustain Tribal environmental programs.

3.1.3 Housed in a 1440 square foot building, the laboratory floor plan (Appendix *19.2*) is divided into functional areas designed to provide a proper environment for high quality chemical and biological analyses and at the same time minimize cross-contamination.

3.2 Instrumentation

3.2.1 Analytical instrumentation

3.2.1.1 Shimadzu GC-14A Gas Chromatography (GC) - ECD, FPD, PID, and FID detectors

3.2.1.2 Eldex 9600 Ternary High Performance Liquid Chromatograph (HPLC) – Fluorescence, UV detectors, and Pickering post column derivatization system

3.2.1.3 Buck 200-A Atomic Absorption Spectrophotometer (AA) with hydride-cold vapor generator

3.2.1.4 Sequoia-Turner Model 390 variable wavelength spectrophotometer

3.2.1.5 HACH DR/2000 spectrophotometer

3.2.1.6 Jenco 6071 pH meter

3.2.1.7 HACH EC-20 portable pH meter

3.2.1.8 VWR Model 1054 conductivity meter

3.2.1.9 HACH CO 150 portable conductivity meter

3.2.2 Extraction instrumentation

3.2.2.1 Waring blender

3.2.2.2 Omni mixer

3.2.2.3 Bronson sonicator

3.2.2.4 Chemical Data Systems concentrator

3.2.3 Balances

3.2.3.1 Mettler Toledo AB204 analytical balance
3.2.3.2 Sartorius Basic top loading balance

4. Organization and qualifications

4.1 The *29 Palms Laboratory* organizational chart is shown in Appendix *19.3*. The names of the management positions, education background, summaries and length of relevant experience are described in the section *19.4*.

4.2 The *29 Palms Laboratory* is certified by the State of California Department of Health Services under ELAP (Certificate No. 2337; Expiration Date 11/30/2000).

5. Responsibilities

5.1 *Laboratory director*

The Laboratory Director is ultimately responsible for the reliability of all analytical data. These responsibilities include, but are not limited to:

5.1.1 Set up goals for the laboratory.
5.1.2 Set up laboratory policies, objectives, principles, & general procedures.
5.1.3 Review and approve the Quality Assurance Program Plan.
5.1.4 Manage the on-going requirements of the QA/QC activities.
5.1.5 Develop and implement new and revised QA procedures to improve data quality.
5.1.6 Conduct routine audits to ensure compliance of the QA program.
5.1.7 Develop standard operating procedures and quality assurance project plans and assure that they are sound, correct, and meet regulatory requirements.
5.1.8 Review and approve the final data reports.
5.1.9 Coordinate laboratory accreditation efforts.
5.1.10 Recruit appropriate laboratory personnel.
5.1.11 Oversee training of laboratory personnel.

5.2 *Laboratory manager*

The Laboratory Manager reports directly to the Laboratory Director and is responsible for the daily operation and management of the laboratory. The responsibilities of this position include:

5.2.1 Receive samples and ensure sample integrity.
5.2.2 Ensure and document the proper use of sample containers and method of preservation.
5.2.3 Document sample conditions as received.
5.2.4 Inform client of all holding times and analysis considerations.
5.2.5 Maintain Chain-of-Custody through sample control.
5.2.6 Prescribe procedures for sample login and receipt.
5.2.7 Ensure proper sample storage prior to analysis.
5.2.8 Ensure timely analysis of samples.
5.2.9 Ensure proper disposal of samples after completion of analyses.
5.2.10 Maintain laboratory inventory and MSDS sheets.
5.2.11 Procure office and laboratory supplies and equipment.
5.2.12 Manage laboratory receiving.
5.2.13 Oversee accounts payable and receivable.
5.2.14 Maintain time sheets and payroll records.

5.3 Quality assurance officer

The QA Officer, who reports directly to the Laboratory Director, is responsible for implementing the QA program for the *29 Palms Laboratory*. To preserve impartiality in data and system reviews and to avoid conflicts of interest, the QA Officer is not involved in routine analysis and production of client data. The duties of this position are:

5.3.1 Prepare and revise the laboratory QAP.
5.3.2 Monitor the QAP to ensure complete compliance with its objectives.
5.3.3 Conduct routine system and performance audits to identify potential problems and to ensure compliance with the standard operating procedures (SOPs).
5.3.4 Oversee the laboratory's external performance evaluation programs and follow up with corrective actions when unacceptable scores are obtained.
5.3.5 Coordinate external QA/QC audits and corrective actions in response to deficiencies identified during laboratory audits.
5.3.6 Establish QC procedures and provide internal control samples.
5.3.7 Establish warning and control limits for every analysis.
5.3.8 Perform statistical analyses of QC data and establish databases that accurately reflect the performance of the laboratory.
5.3.9 Assist in the development of new or revisions to existing SOPs.
5.3.10 Maintain and update all SOPs.
5.3.11 Assure that subcontracted laboratories are providing qualified data with acceptable quality control (QC).

5.4 Analysts

Analysts are responsible for performing routine analysis of environmental samples. General duties include:

5.4.1 Maintain a working knowledge of the 29 Palms Laboratory QAP.
5.4.2 Ensure that all data is generated in compliance with the QAP.
5.4.3 Perform work in strict accordance with the SOPs.
5.4.4 Ensure that all related documentation is complete and accurate.
5.4.5 Perform data entry into computerized laboratory records.
5.4.6 Prepare preliminary and final reports.
5.4.7 Maintain calibration procedures and their frequencies.
5.4.8 Maintain and troubleshoot laboratory instruments.
5.4.9 Update instrument maintenance logs.

5.5 Health and safety officer

The Health and Safety Officer is in charge of public safety operations. The duties are:

5.5.1 Set public safety regulations.
5.5.2 Enforce and implement public safety regulations.
5.5.3 Develop, update, and implement health and safety policies, procedures, and training programs.
5.5.4 Interface with laboratory management and employees in a technical and advisory capacity.
5.5.5 Monitor Federal legislation that may be imposed on the laboratory in the general areas of health and safety.
5.5.6 Ensure proper disposal of hazardous materials.
5.5.7 Coordinate emergency response and maintain effective relations with external emergency services.
5.5.8 Develop and implement an emergency response plan.
5.5.9 Chair health and safety meetings.

5.6 Facility director

The Facility Director is responsible for proper operation and maintenance of the facility. The duties are:

5.6.1 Set facility codes and safety regulations.
5.6.2 Enforce and implements facility building codes.
5.6.3 Enforce facility safety regulations.
5.6.4 Manage routine housekeeping activities.

6. Procurement

The laboratory follows all federal procurement regulations that are applicable. The Laboratory Manager is responsible for purchasing supplies. The Laboratory Director is responsible for purchasing laboratory equipment and subcontract services. The Laboratory QA Officer and the Laboratory Director are responsible for reviewing and approving the technical and quality requirements of each item or service purchased.

6.1 General supplies

6.1.1 Supplies are only purchased from vendors with "known quality" materials. However, audit checks on vendors are not routinely performed.

6.1.2 A purchase order is required for each item purchased.

6.2 Chemicals and solvents

6.2.1 All chemicals are A.C.S. grade or better.

6.2.2 Depending on analytical methods, solvents used are A.C.S. grade, spectrophotometric grade, pesticide grade, or HPLC grade.

6.2.2.1 The opened date is recorded and labeled on the solvent bottles.

6.2.2.2 A solvent blank is run on each lot of solvent before use, and the solvent can only be used if the solvent blank shows no contamination higher than the method detection limit.

6.3 Reference materials

A reference material is a material or substance with one or more properties that are sufficiently well characterized so that it can be used for equipment calibration, method assessment, or assigning values to materials.

6.3.1 Whenever possible, *Standard Reference Materials* (SRM) that are certified by the National Institute of Standards and Technology (NIST) are used as laboratory control standards.

6.3.2 In the absence of certified reference materials, stock standard solutions will be prepared using neat standard material of known quality and purity.

6.3.3 All standard materials are purchased from suppliers with certification of purity and concentration. Certificates are kept in a loose-leaf notebook that is maintained by the laboratory QA Officer.

6.3.4 When possible, each standard is evaluated against previously validated standards. Unqualified standards will be returned to the vendor.

6.3.5 The date of receipt, source, lot number, expiration date, assigned unique lab ID number, and the receiving person will be recorded in a standard inventory logbook.

6.3.6 Each standard container is provided with a label that includes the lab ID number, expiration date, and date opened, date received and the initial of the person that received the standard.

6.3.7 Material safety data sheet (MSDS) is maintained for each standard in a separate loose-leaf binder.

6.4 Glassware

6.4.1 All volumetric glassware is ACS Class A.

6.4.2 Glassware cleaning procedure:

6.4.2.1 Dirty glassware is kept completely immersed in phosphate-free 2% Liquinox detergent.

6.4.2.2 Each piece of glassware is cleaned manually by thorough brushing.

6.4.2.3 Soap residue is removed by rinsing ten (10) times in tap water, ten (10) times in commercial distilled water, and three (3) times in reagent grade water.

6.4.2.4 Glassware is allowed to air dry prior to storage in closed cabinets.

6.4.2.5 When required by specific methods, glassware is acid washed prior to the rinse in *6.4.2.3*.

6.5 Water type and quality

6.5.1 Reagent water

6.5.1.1 Reagent grade water is purchased from a suitable vendor, which meets ACS specifications for Reagent Water, ASTM specifications for Type I water, and USP specification for Purified Water. The water is specially purified by activated carbon, organic absorption, reverse osmosis, mixed bed double-deionization, ultraviolet light irradiation and 0.2 micron membrane filtration.

6.5.1.2 Reagent grade water is used for all analytical procedures that require reagent grade water and is used for final rinsing of laboratory glassware, described above in *6.4.2.3*.

6.5.1.3 For volatile analyses, organic-free reagent is prepared by boiling reagent grade water for 15 minutes and subsequently bubbling a contaminant-free inert gas through the water for 1 hour while maintaining a temperature of 90°C.

6.5.2 Distilled water

6.5.2.1 Distilled water is purchased from a commercial vendor.
6.5.2.2 Distilled water is only used for preliminary rinsing of washed glassware prior to final rinsing with reagent grade water.

6.5.3 Tap water

6.5.3.1 The Coachella Valley Water District supplies municipal tap water to the *29 Palms Laboratory*.
6.5.3.2 Tap water is used for preparation of glassware cleaning solutions and for initial rinsing during the glassware cleaning procedure.

6.6 Balances

6.6.1 Balance calibration standards are NIST (National Institute for Standards and Technology) Class ANSI/ASTM weight sets that are calibrated to primary standards by the manufacturer.
6.6.1.1 Calibration certificates are kept in a loose-leaf notebook that is maintained by the QA Officer.
6.6.2 Each balance is calibrated monthly using at least five different calibration weight standards covering the working range of the balance.
6.6.3 Weekly calibration check is performed using a single calibration standard weight that is not a member of the original calibration set.
6.6.3.1 Control charts are maintained for each balance.
6.6.3.2 Balance must be recalibrated when the calibration check deviates from the true value by more than two standard deviations.

6.7 Thermometers

6.7.1 Thermometers are graduated in 0.5°C increments or less for incubators and 1°C increments or less for other equipment.
6.7.2 Incubator and refrigerator thermometers must have their bulbs immersed in liquid.
6.7.3 Thermometers must be calibrated semi-annually against a reference NIST thermometer.
6.7.3.1 Each thermometer is assigned a unique ID number.
6.7.3.2 Calibration results are recorded in a thermometer calibration logbook.
6.7.3.3 Temperature adjustment factors are posted in the laboratory for daily reference.

6.7.4 Thermometers must not be used at the temperature of calibration if they are more than 1°C off from the reference thermometer.

6.7.5 Reference thermometers must be recalibrated every 3-5 years.

6.7.6 Certificates for all thermometry standards are kept in a loose-leaf notebook that is maintained by the QA Officer.

6.8 High pressure gases

6.8.1 The purity of high-pressure gases shall satisfy the requirements of the corresponding instruments.

6.8.2 Carrier gases used for GC analyses are further treated, dried, or de-oxygenized before use.

6.8.3 Gas cylinders are chained to the wall and are stored in an enclosed shed located outside of the laboratory.

6.8.4 The following gases and corresponding instruments are currently in use in the laboratory:

- Acetylene..... AA
- Helium..... HPLC
- Hydrogen..... GC-FPD, FID
- 99.9% Nitrogen (Ultra pure Grade)..... GC
- Air..... GC-FPD, FID

6.9 Refrigerators and Freezers

6.9.1 Refrigerators and freezers are designated for either samples only, or for standards/chemicals only.

6.9.2 Temperature of each refrigerator and freezer is monitored using calibrated thermometers that are immersed in liquid.

6.9.3 The refrigerator and freezer temperatures are recorded each working day and documented in a refrigerator/freezer temperature logbook.

6.9.3.1 The acceptable temperature range for refrigerators is $3^{\circ} \pm 2$ standard deviations (SD).

6.9.3.2 The acceptable temperature range for freezers is $20^{\circ} \pm 2$ SD.

6.10 Incubators

6.10.1 The incubator must maintain $35 \pm 0.5^{\circ}C$.

6.10.2 Temperatures must be recorded twice per day with readings separated by at least 4 hours on the incubator temperature logbook.

6.10.3 If more than one incubator shelf is used for samples, thermometers must be placed on the top and bottom shelves (not on the floor of the incubator) to assure temperature uniformity.

6.11 Subcontracting of analytical work

When our capabilities are unable to meet client requirements, work may be subcontracted upon client approval. Only approved laboratories will be used and for certain projects, the subcontracted laboratories must be approved by the specified regulatory agency. Instructions will be documented on a Chain-of-Custody that is sent with the samples to the subcontracted laboratory. A blind QA sample is recommended and is included with each batch of contracted samples given client consent. After the subcontracted work is completed, the report will go through the same review and approval process as is conducted for in-house data evaluation. The final report will clearly state that the work was performed by the subcontractor and not by the *29 Palms Laboratory*.

7. Sampling Procedures

In most cases, the *29 Palms Laboratory* will rely on the client to collect and ship samples for analyses. It is highly recommended that a sound planning process be performed to address the project's analytical issues and potential problems. The *29 Palms Laboratory* can assist in the preparation of client quality assurance project plan (QAPP) when needed. On request, the laboratory will provide all necessary sample and shipping containers along with sampling guidelines and Chain-of-Custody documentation. The generation of quality data begins with the collection of the samples and therefore the integrity of the sample collection process is of concern to the laboratory. Samples must be collected in such a way that no foreign material is introduced into the sample and no material of interest escapes from the sample prior to analysis.

7.1 Sampling guidelines

To ensure sample integrity, the following guidelines must be followed:

7.1.1 Samples must be collected in the appropriate containers in proper amount or volume depending on the number of analytes and the requirements of the individual method of analysis. In general, glass containers are used for organic parameters and polyethylene containers for inorganic/metal parameters. Appendix *19.6* provides the details regarding containers and minimum sample volumes.

7.1.2 *29 Palms Laboratory* will provide the client with sample containers that are purchased from suppliers that have provided a certificate of cleanliness.

7.1.3 The *29 Palms Laboratory* will keep records of numbers of bottles sent for requested analyses and once bottles are received by the client, it is the responsibility of the client to use bottles accordingly or protect bottle cleanliness prior to sampling.

7.1.4 Cleanliness by sampling personnel is critical to avoid contamination.

7.1.5 The samples must be stabilized with a preservative (chemical and/or physical) when appropriate, at the time of collection. This is done to minimize loss of analytes due to absorption, degradation, volatilization, or chemical transformation. Appropriate preservatives are also available upon request.

7.1.6 A representative sample must be collected.

7.1.7 If possible, analytes that are unstable in waters with high productivity or microbiological activity, such as dissolved oxygen, pH, alkalinity, nitrate, or sulfide, should be measured in the field at the time of sampling.

7.1.8 Each sampling container must be properly and clearly labeled. Sample labels are available from the laboratory.

7.1.9 The samples should be shipped as soon as possible, preferably by overnight delivery service, in a sealed cooler containing blue ice at 4°C. Commercial carriers can advise as to the laws governing the shipping of environmental and potentially hazardous samples.

7.1.9.1 The cooler should be shipped to:

29 Palms Laboratory
Tribal EPA
46-200 Harrison Place
Coachella, CA 92236
760-775-1457

7.1.9.2 A Chain-of-Custody form must be included with the samples.

7.1.9.3 A work order listing the analyses desired, detection limits, turnaround and holding times must be provided with the samples. The work order should also include instructions for reporting and a reference to a QAPP if available.

7.2 Routine sampling protocol

7.2.1 Each sample collected will be assigned a unique sample number.

7.2.2 The sampler will enter a description of each sample on a dated Chain-of-Custody form.

7.2.3 Unless noted otherwise, samples will be stored in a cooler at 4°C for transportation to the laboratory.

7.2.4 The laboratory will not accept samples without the submission of a Chain-of-Custody form. It is the responsibility of the laboratory to ensure that samples are properly submitted and that representative sub samples are taken for analysis.

7.3 Method of sample handling for pesticide analysis

7.3.1 General sampling precautions

7.3.1.1 Care must be exercised in collecting samples for pesticide analysis.

7.3.1.2 Erroneous results may be obtained with improper sampling techniques due to contamination and degradation of pesticide compounds.

7.3.1.3 Analytical methods are limited in most instances to the determination of the parent pesticide residues and are not intended to recover and measure metabolites or decomposition products unless requested.

7.3.1.4 All samples should be kept at 4°C following collection up to the time of analysis.

7.3.2 Water and soil samples

7.3.2.1 Containers used to collect samples for the determination of pesticides should be soaped and water washed followed by a final alcohol rinsing and then dried.

7.3.2.2 Preferably, containers should be purchased with certificates of cleanliness.

7.3.2.3 The sample containers should be of amber glass and have screw caps with Teflon lined septa. In the case where Teflon is not available, alcohol rinsed aluminum foil may be used as a liner. Note, however, that highly acidic or basic samples may react with the aluminum foil, causing eventual contamination of the samples. Plastic containers or lids should not be used due to possible contamination with interfering hydrocarbons.

7.3.2.4 For water samples, fill two (2) 1-liter containers.

7.3.2.5 For soil samples, fill a 1-pint container.

7.3.3 Produce samples

7.3.3.1 Produce samples should be collected in a brown paper bag.

7.3.3.2 Do not use plastic bags for reasons noted above for plastic containers.

7.4 Method of sample handling for microbiology analysis

7.4.1 The sampler will record field sampling information, which includes the sample time and date, location, sampler's name, sample type (routine, repeat or request), the collection point type (tap, well head, etc.), and chlorine residual if the system is chlorinated. Each sample collected is assigned a unique sample identification number.

7.4.2 Samplers should wash their hands thoroughly prior to beginning sampling. The capped sterile sample bottles containing sodium thiosulfate ($Na_2S_2O_3$) to neutralize residual chlorine if present are not opened until use. Sample bottles that are broken or have been opened before time of sampling will not be used.

7.4.3 Sample is collected into the sterile bottle by removing the cap, being careful not to touch the inside of the cap or bottle. The sample bottle is not rinsed prior to sample collection.

7.4.4 For water from faucets or pumps, remove any attachments such as hoses, filters or aerators and then run the water for 2 minutes before taking the sample. Sample from the water stream without touching the faucet or pump with the bottle. Fill the bottle leaving a space at the top. Cap the bottle tightly and label it with the sampler's name, the sample location, number, or other identifier, and the date and time.

7.4.5 For potable water systems, a cold water tap is selected that is receiving water from a service pipe that is directly connected with the main, rather than from a water heater, cistern or storage tank. Sampling from leaking faucets or faucets that allow water to flow outside of the tap is avoided. If tap cleanliness is questionable, a solution of 100 mg/l sodium hypochlorite (about 10ml or 2 teaspoons of household bleach per gallon of water) is used to disinfect the faucet before sampling.

7.4.6 For wells with hand pumps, pump for approximately 5 minutes before sampling. For open wells try to collect the sample by putting the bottle directly in the well by hand or by lowering the bottle into the well. Try to avoid contaminating the sample with any surface scum.

7.4.7 For surface waters, take samples by holding the bottle near the base and plunging it, neck downward, below the surface. Turn the bottle until it points slightly upward and is directed toward the current. If there is no current, as in the case of a reservoir, create a current artificially by pushing the bottle forward horizontally in a direction away from the hand. For shallow waters, such as streams, springs, seeps or other types of discharges, attempt to sample the water without touching any solids.

8. Sample Control

8.1 Sample receiving and Chain-of-Custody

8.1.1 Upon receipt, the samples and relevant documents are checked carefully. Special attention is given to the following:

- Completeness of information in the work order and Chain-of-Custody
- General condition of the samples, such as temperature or broken items
- Presence of preservative
- Labels and sample IDs are consistent with the Chain-of-Custody
- Compare collection date and holding time requirements
- Number of samples matches that on the Chain-of-Custody and the work order
- Compare the number of containers for each sample with the Chain-of-Custody
- Sample volume
- Required turnaround time
- Special requirements for analysis or QC report

In the case of abnormal conditions, contact the client and document the corrective action taken.

8.1.2 If not already available, a Chain-of-Custody form is filled out immediately upon receiving samples.

8.1.3 The Chain-of-Custody form includes date, time, name, and address of client, name and address of sampler, type of samples, and name of person relinquishing the samples. For produce samples, a declaration of channel of trade status must be signed.

8.1.4 Notes will be made on the condition of sample, method of storage, type of analysis requested, and the history of the samples.

8.1.5 Samples received by the laboratory are stored in a refrigerator dedicated for the storage of samples only. Samples are kept at 1 to 5°C until extraction and analysis.

8.1.6 The original Chain-of-Custody is placed in a logbook and a copy is provided in the final report data package.

8.1.7 All samples will be extracted within 7 days upon arrival to the laboratory.

8.1.8 All extracted samples will be analyzed within 30 days.

8.2 Sample log-in

8.2.1 Each sample is logged into a sample-receiving logbook and is assigned a unique laboratory ID number that is cross-referenced to the client's field sample ID numbers and other information pertinent to the sample.

8.2.2 All samples are placed in a refrigerator that is dedicated for the storage of samples.

8.3 Sample rejection

8.3.1 Any samples that are broken upon receipt will be rejected.

8.3.2 Any sample for which the holding time has passed will be rejected.

8.3.3 The client will be notified of samples that were improperly preserved.

8.3.4 Any unlabeled samples will be rejected in a batch of more than one sample.

8.3.5 Any samples for which container types and cooler temperatures are not in compliance with EPA methods will be placed on hold in the sample refrigerator and the client will be contacted immediately.

8.4 Sample storage

8.4.1 All samples are stored in accordance with method specifications.

8.4.2 Samples are stored in a refrigerator dedicated for samples.

8.4.3 Water samples for metal only (except for chromium VI) are filtered and stored at room temperature.

8.4.4 Temperature of each refrigerator is monitored and recorded twice daily.

8.4.5 Samples and extracts are stored for 45 days after arrival unless specific requests are made for longer storage.

8.5 Sample disposal

8.5.1 Samples are stored in temperature-controlled refrigerators ($3 \pm 2^{\circ}C$) for 45 days, starting from the receiving date. After 45 days, samples are removed from the refrigerator unless clients request a longer storage time.

8.5.2 Samples are disposed of in several different ways:

- *8.5.2.1* Return to clients.
- *8.5.2.2* Discharging water samples to drain if not contaminated.
- *8.5.2.3* Samples contaminated with microorganisms will be sterilized by autoclaving at 121°C for 30 minutes prior to disposal.
- *8.5.2.4* Samples contaminated with hazardous chemicals are collected in hazardous waste containers for disposal by a hazardous waste disposal company.

9. Calibration Procedures and Frequency of Calibration

9.1 Calibration standards

The laboratory control standards are used to prepare calibration, spiking, surrogate, and internal solutions. In general, primary reference standards, working standards, and standard solutions are handled in such a way as to minimize exposure to moisture, air, heat, and light to prevent deterioration and evaporation.

9.1.1 Quality control

9.1.1.1 The procurement of laboratory control standards is described in Section 6.3.

9.1.1.2 Standard solutions (stock, composite, calibration, and surrogate) are stored in the dark at 4°C in polytetrafluoroethylene (PTFE) or silicone-Teflon sealed amber glass.

9.1.1.3 When a lot of standards is prepared, the aliquots of that lot are stored in individual small vials.

9.1.2 Traceability of standards

9.1.2.1 Analytical standards are traceable either to standard reference materials, neat materials, or certificates of analyses provided by the supplier.

9.1.2.2 Record of all stock standards preparations is maintained in a calibration standard logbook.

9.1.3 Expiration time criteria

9.1.3.1 The manufacturer or vendor provides the expiration date of neat and ampoule standards.

9.1.3.2 Stock solutions must be replaced after one year or sooner if routine QC tests indicate a problem.

9.1.3.3 Working standard solutions must be replaced after six months or sooner if routine QC tests indicate a problem.

9.1.4 General guidelines for standard preparation

9.1.4.1 Analytical reagent grade materials are used in preparation of stock and working standards.

9.1.4.2 All standard preparations are documented in a calibration standard logbook containing an assigned unique laboratory ID number, date prepared, name of the standard, source or supplier of standards, lot number, quality and quantity of standards, concentration, solvent used, expiration date, and the person recording the information.

9.1.4.3 Each preparation of standard is properly labeled as to name, concentration, unique laboratory ID number, solvent used, preparer initials, and expiration date. Each standard solution is referenced to the entry in the calibration standard logbook through its unique laboratory ID number.

9.1.4.4 Newly prepared standards and QC check samples are checked against old standards to verify continuity and continued validity of proper instrument operations.

9.1.4.5 Working standards are prepared from primary stock standards and are traceable to their original source by entry into the calibration standard logbook.

9.1.4.6 To prevent cross contamination of samples, balance and surrounding areas are thoroughly cleaned with soap and water after weighing neat pesticide standards.

9.1.5 Stock standard solutions

9.1.5.1 Stock standard solutions are prepared from neat standard materials or are purchased as certified solutions.

9.1.5.2 Standards are weighed to 0.0001 g. accuracy, dissolved in reagent grade solvent, and diluted to volume in Class A volumetric flasks.

9.1.5.3 If the purity of the compound is $\geq$96%, the weight is used without correction to calculate the concentration of the stock standard solution.

9.1.6 Composite stock standard solutions

9.1.6.1 Composite stock standards are prepared from individual stock solutions or are purchased as certified solutions.

9.1.6.2 For composite stock standards containing less than 25 components, exactly 1 mL of each individual stock solution at a concentration of 1000 mg/L is added and mixed together with solvent in a 25 mL volumetric flask.

9.1.6.3 For composite standards containing more than 25 components, repeat *9.1.6.2* using a volumetric flask of greater capacity.

9.1.6.4 If necessary, composite solutions are further diluted to the desired concentration.

9.1.7 Working calibration standards

9.1.7.1 A set of calibration standards is used for initial and periodic calibration of an instrument or a method.

9.1.7.2 Calibration standards are prepared at a minimum of five different concentrations by diluting individual or composite stock standards in appropriate solvent.

9.1.7.3 Whenever possible, the working concentration range corresponds to the expected range of concentrations found in actual samples. In addition, the concentration range should bracket the linear range of the instrument or method.

9.1.8 Calibration check standards

9.1.8.1 To determine the state of performance of an instrument between periodic calibrations, continuous calibration verification (CCV) is performed using calibration check standard solutions.

9.1.8.2 Calibration check standard solutions are prepared using a stock standard solution that is prepared independently from the stock standard solutions used in preparing calibration standards.

9.1.9 Surrogate spike standards

9.1.9.1 Surrogate compounds, if available, are used to monitor the performance of organic analytical methods. The *29 Palms Laboratory* follows the guidelines and recommendations for surrogates in SW-846 Method 3500B, *Organic Extraction and Sample Preparation.*

9.1.9.2 In the absence of specific recommendations, a compound that is chemically similar to the analyte group but is not expected to occur in the environmental sample will be selected as surrogate.

9.1.9.3 Surrogate standards are added to all samples, method blanks, matrix spikes, calibration standards, and calibration check standards just prior to extraction or processing.

9.1.10 Matrix spike standards

9.1.10.1 Stock matrix spike solutions are prepared from diluting individual or composite calibration stock standard solutions in water miscible solvent.

9.1.10.2 Alternatively, commercially prepared stock solutions that are certified by the manufacturer or an independent source are used.

9.1.10.3 The matrix spike standards are prepared by diluting stock matrix spike solutions with a water miscible solvent.

9.1.10.4 Matrix spiking solutions are prepared independently of calibration standards.

9.2 Instrument calibration

All instruments are calibrated in accordance with the appropriate analytical methodology. Each instrument is calibrated with standard solutions appropriate to the type of instrument and the working range established for the analytical method. Prior to analysis of samples, instruments are calibrated by generating a calibration curve for each analyte of interest. The calibration curve encompasses the linear working range of the method whenever possible.

9.2.1 Gas chromatography

9.2.1.1 In general, the instrument is calibrated for all target compounds.

9.2.1.2 For each method, an initial calibration curve is produced using five or more concentrations of every target compound.

9.2.1.3 The concentration ranges are selected based on linearity and the expected concentrations in most of the samples.

9.2.1.4 Verification of the initial calibration will be performed after the last sample in the batch or after every 10 samples or after 12 hours using a single concentration of a calibration check sample.

9.2.1.5 If the calibration check sample is out of control, then all samples analyzed since the last point that was in control will be rerun.

9.2.2 Liquid chromatography

9.2.2.1 Calibration standards and acceptance criteria vary depending on the analytical methodology.

9.2.2.2 Initial calibration is performed prior to performing sample analyses and consists of analyzing at least five different concentrations of each target analyte. The concentration range is within the linear working range for the method and brackets the expected analyte concentration in the sample.

9.2.2.3 The initial calibration curve is checked using continuous calibration verification (CCV) at the end of each batch run or after every 10 samples or every 12 hours, whichever is more frequent.

9.2.3 Atomic absorption (AA)

9.2.3.1 An initial calibration curve is prepared using a minimum of a calibration blank and three concentrations of standard.

9.2.3.2 Calibration is verified with a blank and a continuous calibration verification (CCV) standard.

9.2.4 Wet chemistry

9.2.4.1 Each method undergoes initial calibration prior to analysis of samples.

9.2.4.2 Calibration consists of defining the linear working range by using a series of standard solutions and identifying potential interferences.

9.2.4.3 Continuous calibration verification (CCV) is performed after every 10 samples.

9.3 Acceptance criteria of calibration

9.3.1 The acceptance criteria of initial calibration are:

9.3.1.1 For most methods, the percent relative standard deviation (% RSD) of the initial calibration curve should be less than 15%.

9.3.1.2 The regression coefficient (r) should be 0.99 or better.

9.3.1.3 A stable zero point is required for AA and wet chemical methods.

9.3.1.4 Recalibration is required whenever out-of-control conditions occur.

9.3.2 The acceptance criteria for continuous calibration verification (CCV) are also dependent on the analytical methods.

9.3.2.1 For most GC analyses, a percent difference of less than 15% from the initial calibration value is required.

9.3.2.2 For AA and wet chemical analyses, a percent difference of 10% is normally required. For AA methods, a stable zero point must be verified after every 10 samples using a blank.

9.3.2.3 For physical property analysis, a percent difference of 10% is required.

9.3.2.4 Recalibration is required when CCV results exceed the acceptance criteria.

9.4 Calibration verification frequency

9.4.1 The frequency of calibration and continuous calibration verification (CCV) are determined by the manufacturer's guidelines and the requirements of the method used.

9.4.2 For organic analyses, the *29 Palms Laboratory* performs an initial calibration prior to each batch run followed by continuous calibration verification (CCV) after each batch, after every 10 samples, or after 12 hours, whichever is more frequent.

9.4.3 For inorganic analyses, a calibration check is run after every 10 samples after generation of the initial calibration curve.

9.5 Calibration documentation procedure

9.5.1 Initial calibration data are entered into an electronic spreadsheet for regression analyses and stored electronically.

9.5.2 The percent relative standard deviation (%RSD) must be less than or equal to 15% for acceptance of the calibration curve for organic and wet chemistry analyses.

9.5.3 The %RSD must be less than or equal to 10% for atomic absorption spectrophotometric and physical properties analyses.

9.5.4 The correlation coefficient of all calibration curves must be greater than 0.99.

9.5.5 Average response factors are used for all calibration calculations unless stated otherwise.

9.5.6 A summary of the calibration data is printed and the hard copy stored in a calibration logbook.

9.6 Calibration corrective action procedures

9.6.1 Initial calibration curve does not meet acceptance criteria

9.6.1.1 Examine instrument performance.

9.6.1.2 Perform recalibration.

9.6.1.3 If there are instrumental malfunctions, service the instrument.

9.6.2 Continuing calibration verification is out of control

9.6.2.1 Examine instrument performance.
9.6.2.2 Rerun CCV to determine if recalibration is required.
9.6.2.3 Determine if reanalysis of samples is required.
9.6.2.4 If there are instrumental malfunctions, service the instrument.

10. Analytical Procedures

EPA methods *SW-846* and *Methods and Guidance for Analysis of Water* are the principal references for methods used at *29 Palms Laboratory*. Other method references include the 20th Edition of *Standard Methods for the Examination of Water and Wastewater* and the14th Edition of AOAC *Official Methods of Analysis*. The following are the current analytical methods that are listed in our ELAP Certificate No. 2337, which expires on 11/30/2000.

10.1 Methods of analysis

10.1.1 Organic chemistry

10.1.1.1 Pesticides

10.1.1.1.1 EPA Method 8081A - Determination of Chlorinated Pesticides
10.1.1.1.2 EPA Method 8141A - Determination of Organophosphorus Pesticides
10.1.1.1.3 EPA Methods 632 and 8318 - Determination of N-Methylcarbamates

10.1.2 Inorganic chemistry

10.1.2.1 EPA Method 242.1 - Magnesium
10.1.2.2 EPA Method 352.1 - Nitrate
10.1.2.3 EPA Method 150.1 - pH
10.1.2.4 EPA Method 365.3 - Phosphate, ortho
10.1.2.5 EPA Method 160.3 - Residue, Total
10.1.2.6 EPA Method 160.1 - Residue, Filterable (TDS)
10.1.2.7 EPA Method 120.1 - Specific Conductance
10.1.2.8 EPA Method 375.4 - Sulfate

10.1.3 Microbiology

10.1.3.1 EPA Method 908A - Standard total coliform MPN tests
10.1.3.2 EPA Method 908C - Fecal coliform MPN procedure

10.2 Initial demonstration of capability

For every method used in the laboratory, there must be an initial demonstration of capability prior to performing sample analysis and determining method detection limits (MDL). Depending on the method of interest, the procedure used for qualification includes:

10.2.1 Generate an acceptable initial calibration curve.
10.2.2 Analyze seven (7) laboratory-fortified blanks (LFB) spiked with each method analyte at a representative concentration of approximately 10 times estimated detection limit (EDL).
10.2.2.1 The percent recovery value of each analyte must fall in the range of the average recovery plus or minus 30%.
10.2.2.2 For those analytes falling outside the acceptance criteria, the initial demonstration procedures must be repeated.
10.2.3 Determine precision and accuracy of the method.
10.2.4 Monitor method performance and calculate the method detection limit (MDL).
10.2.5 Prepare a standard operating procedure (SOP) for the method.

10.3 Analytical batch

10.3.1 Definition

10.3.1.1 A batch is a group of samples containing not more than 20 samples that are similar with respect to the sampling or testing procedures being employed and are processed as a unit.
10.3.1.2 Manipulation, processing, and analysis of each sample in a batch are performed simultaneously or in a continuous sequence without interruption.
10.3.1.3 All samples in a batch must have the same matrix.

10.3.2 Batch QC samples

10.3.2.1 Batch QC samples include method blank (MB), matrix duplicate, matrix spike, matrix spike duplicate.

10.4 Calibration procedures

10.4.1 External standard techniques will be routinely used unless stated otherwise.

10.4.2 Initial calibration curve is generated using calibration standards containing analytes of interest, which are prepared at five (5) or more different concentration levels.

10.4.3 Preferably, the concentrations used are within the linear range for the method, which is defined as a constant ratio of response to concentration (response factor) over the working range concentrations. Environmental samples not within the working range will be diluted.

10.4.3.1 A percent relative standard deviation (RSD) is calculated according to the following formula:

$$RSD = \frac{SD}{CF} \times 100$$

where RSD = Percent Relative Standard Deviation
SD = Standard Deviation
CF = Calibration Factor

10.4.3.2 Acceptance criterion for RSD is 15% or less.

10.4.3.3 Regression analysis is performed on the calibration data and a correlation coefficient (r) is calculated for each calibration curve.

10.4.3.4 Acceptance criterion for r is >0.99.

10.4.3.5 Recalibration must be performed if either RSD and/or r exceed their acceptance criteria

10.4.3.6 An average response factor (RF) is used to calculate analyte concentrations in environmental samples.

10.5 Quality control

10.5.1 Continuous calibration verification (CCV)

10.5.1.1 Calibration check standards consisting of target compounds are used to monitor and evaluate method performance.

10.5.1.2 For each batch, CCV is performed for each instrument and the associated response factor (RF) for each method analyte is compared against the average RF of the latest initial calibration curve.

10.5.1.3 CCV will be performed at the end of each batch analytical run or after every 10 samples, whichever is more frequent.

10.5.1.4 Acceptance criteria for CCV vary depending on the method of analysis. In general, the acceptance criterion for organic analyses is CF $\pm$ 15%; for metals, inorganic and physical properties analyses, it is CF $\pm$ 10%. If the average response for all analytes is within the acceptance limit, then the calibration is considered to be verified. If the limit is exceeded, a new calibration standard curve must be prepared.

10.5.2 Method blank (MB)

10.5.2.1 Method blank is an analyte-free matrix that is carried through the complete sample preparation and analytical procedure. It is used for documenting *contamination* resulting from the analytical process.

10.5.2.2 One method blank is run for each analytical batch.

10.5.2.3 Acceptance criteria are <MDL, <5% of regulatory limit associated with the analyte, or < 5% of the sample result for the same analyte, whichever is greater.

10.5.2.4 Corrective actions must be taken if the MB does not meet the acceptance criteria, which include locating and reducing the source of the contamination and reextracting and reanalyzing any samples associated with the contaminated MB.

10.5.2.5 Sample results are not corrected for blank contamination unless required by the specific method.

10.5.3 Laboratory control sample (LCS)

10.5.3.1 LCS consists of an aliquot of clean (control) matrix similar to the sample matrix and of the same weight and volume, which is spiked with the same analytes as the matrix spike. It is used to document laboratory *performance*. When the results of the matrix spike analysis indicate a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis on a clean matrix.

10.5.3.2 The concentration of each analyte in the LCS is the same as those in the matrix spike, which is usually near the middle of the linear calibration range. For regulatory compliance monitoring, the matrix spike is at the regulatory concentration limit or action level.

10.5.3.3 One LCS is run for each analytical batch.

10.5.3.4 Calculation of % recovery (%R):

$$\%R = \frac{C_s - C_u}{C_n} \times 100$$

where C_s = Measured analyte concentration of spiked sample
C_u = Measured analyte concentration of unspiked sample
C_n = Nominal analyte concentration of spiked sample

10.5.3.5 In general, the acceptance criterion for %R is at least from 70 – 130%.

10.5.3.6 In most cases, however, equal or stricter laboratory acceptance limits for %R and RPD are determined by calculating a running average and associated standard deviation (SD) of the most recent 20 analyses.

10.5.3.7 For a given matrix, the control limit (CL) and warning limit (WL) for %R are:

$$CL = \overline{\%R} \pm 3SD \text{ (~99\% confidence interval)}$$

$$WL = \overline{\%R} \pm 2SD \text{ (~95\% confidence interval)}$$

where CL = Control limit
WL = Warning limit

$\overline{\%R}$ = Average percent recovery
SD = Standard deviation

10.5.4 Matrix duplicate (MD)

10.5.4.1 Matrix duplicate is an intralaboratory split sample that is used to document the *precision* of a method in a given matrix.

10.5.4.2 One MD is run for each analytical batch of inorganic analyses.

10.5.4.3 Acceptance criteria for analyte recovery are the same as those described for LCS.

10.5.5 Matrix spike (MS)

10.5.5.1 A matrix spike is an aliquot of sample spiked with a known concentration of analyte(s) prior to sample preparation and analysis. It is used for documenting the bias of a method in a given sample matrix.

10.5.5.2 One MS is run for every batch of organic analyses.

10.5.5.3 Acceptance criteria for analyte recovery are the same as those described for LCS.

10.5.6 Matrix spike duplicate (MSD)

10.5.6.1 Matrix spike duplicate is an intralaboratory split sample that is spiked with concentrations of analytes identical to those of the MS. As with MS, the analytes are spiked prior to sample preparation and analysis. MSD is used for documenting *precision* and *bias* of a method in a given sample matrix.

10.5.6.2 One MSD is run for every batch of organic analyses. If analytes are present in the test samples, then a MD may be used as an alternative.

10.5.6.3 %R is calculated as described for LCS.

10.5.6.4 Relative percent difference (RPD) of the concentrations is calculated according to the following formula:

$$RPD = \frac{|C_1 - C_2|}{(C_1 + C_2)/2} \times 100$$

where RPD = Relative percent difference
C_1 = Measured concentration of MS
C_2 = Measured concentration of MSD

10.5.6.5 Acceptance limits for %R and RPD are determined by calculating a running average and associated standard deviation (SD) of the most recent 20 continuous analyses.

10.5.6.6 For a given matrix, the control limit (CL) and warning limit (WL) for each spike compound are:

$$CL = \overline{\%R} \text{ or } \overline{RPD} \pm 3SD \quad (\sim 99\% \text{ confidence interval})$$

$$WL = \overline{\%R} \text{ or } \overline{RPD} \pm 2SD \quad (\sim 95\% \text{ confidence interval})$$

where CL = Control limit
WL = Warning limit

$\overline{\%R}$ = Average percent recovery
SD = Standard deviation

10.5.7 Surrogate Spike (SS)

10.5.7.1 Surrogate standards are added to all samples, method blanks, matrix spikes, calibration standards, and calibration check standards just prior to extraction or processing.

10.5.7.1.1 The purpose of the surrogate is to monitor method performance for each sample.

10.5.7.1.2 Information on the specific surrogate that is to be used is found in the standard operating procedure (SOP) for each specific method.

10.5.7.2 Surrogate recovery (%R) is calculated and evaluated based on control and warning limits that are established using the same procedure described in section *10.5.3*.

10.5.7.3 If surrogates are outside acceptance criteria, samples will be reextracted and reanalyzed to determine if the out of control condition was due to a matrix effect or a laboratory error.

10.5.7.3.1 A matrix error is indicated if surrogates remain outside acceptance criteria following repeat extraction and analysis.

10.5.7.3.2 A laboratory error is indicated if surrogates are within acceptance criteria following repeat extraction and analysis.

10.5.8 Laboratory reagent blanks (LRB)

10.5.8.1 A laboratory reagent blank (LRB) will be run every time a new lot of reagents is received.

10.5.8.2 Sources of contamination are determined and interference eliminated prior to sample processing.

10.5.9 Confirmatory Analyses

10.5.9.1 All positive results for pesticide analyses will be confirmed by reanalysis of the sample extract using a second analytical column.

10.5.9.2 Both pesticide identification and quantification will be confirmed.

11. Detection Limits

Detection limit is the lowest concentration of an analyte that can be measured. Various terms have been used to express detection limit, such as instrument detection limit (IDL), method detection limit (MDL), practical quantitation limits (PQL), and reporting limit (RL).

11.1 Instrument detection limit (IDL)

11.1.1 Instrument detection limit is the lowest analyte level that an instrument can measure and report with 99% confidence that the concentration is greater than zero.

11.1.2 IDL is determined performing at least seven consecutive analyses of standard analyte solutions at concentrations that are 3-5 times the anticipated instrument detection limit.

11.1.3 The following formula is used to calculate the instrument detection limit:

$$IDL = 3.143 \times SD$$

where IDL = Instrument detection limit
SD = standard deviation

11.2 Method detection limit (MDL)

11.2.1 Method detection limit is the lowest analyte level that a method can measure and report with 99% confidence that the concentration is greater than zero.

11.2.2 MDL is determined performing at least seven consecutive analyses of laboratory control samples (LCS) that contain analyte concentrations that are 3-5 times the anticipated method detection limit.

11.2.3 The following formula is used to calculate the method detection limit:

$$MDL = 3.143 \times SD$$

where MDL = Method detection limit
SD = Standard deviation

11.3 Estimated quantitation limit (EQL)

11.3.1 Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. EQL is generally 5 to 10 times the MDL; however, sample EQL is highly matrix-dependent.

11.3.2 The *29 Palms Laboratory* will set EQL according to EQL guidelines that accompany the analytical method if available. In the absence of guidelines, the EQL will be nominally chosen at 3-10 times the MDL depending on the matrix.

11.4 Reporting limit (RL)

11.4.1 The *29 Palms Laboratory* uses MDL as the reporting limit (RL).
11.4.2 Upon client's request or contractual requirements, EQL or both MDL and EQL may be used as RL.
11.4.3 Results below RL are reported as *n.d.* (not detected).

12. Data Reduction, Validation and Reporting

All analytical data are reduced and reviewed prior to the final report in order to assure the validity of the data package and the reported data. All data must be generated and reduced following protocols specified in the appropriate SOPs.

12.1 The analyst has the primary responsibility for the correctness and completeness of the analytical data by ensuring the following:
12.1.1 Sample preparation information is recorded in a bound laboratory notebook and is correct and complete;
12.1.2 Analysis information is correct and complete;
12.1.3 The appropriate SOPs have been followed;
12.1.4 Analytical results are correct and complete;
12.1.5 QC samples are within established control limits;
12.1.6 Blanks are within appropriate QC limits;
12.1.7 Analytical and/or preparation holding times are met;
12.1.8 Documentation, including corrective actions, is complete.
12.2 Calibration data, date of extraction and analysis, and name of analyst are included in the data package.
12.3 All sample analytical data are stored electronically and any problems with the analyses or QC procedures are recorded in a bound laboratory notebook.
12.4 All calculations and formulas are presented in the data package and raw and calculated data stored electronically.
12.5 Corrective action will be taken for out of control situations as soon as possible.
12.6 All results are reviewed and signed by the quality assurance officer and the laboratory director before the final report is released.
12.7 Complaints about laboratory performance should be directed to the Laboratory Manager. Every possible effort will be made to rectify problems.
12.8 If a resolution to the problem cannot be found, those with the complaint will be referred to the Laboratory Director.

13. Document Management

The accurate and complete documentation of all laboratory procedures, activities, and responsibilities is an important element of this quality assurance plan. The *29 Palms Laboratory* maintains the following types of documents:

13.1 Laboratory notebooks and logbooks

13.1.1 Logbooks and notebooks are used for recording laboratory operations such as sample preparation, sample analysis, calibration, standard and reagent preparation, and equipment operation and maintenance.

13.1.2 Both notebooks and logbooks are bound and information is recorded in ink according *GLP-Notebooks and Logbooks 1.0*.

13.1.3 Each page is routinely reviewed and signed by the laboratory director or the QA officer.

13.1.4 Logbooks include, but are not limited to the following:

- *13.1.4.1* Sample login;
- *13.1.4.2* Calibration;
- *13.1.4.3* Spike recovery;
- *13.1.4.4* Maintenance;
- *13.1.4.5* Daily operation.

13.2 Good laboratory practices

13.2.1 Good laboratory practice procedures (GLPs) are documents that cover activities related to quality analytical work, but are not specifically associated with a single analysis.

13.2.2 GLPs include:

- *13.2.2.1* Job Qualification and Descriptions;
  - *13.2.2.1.1* Laboratory Director
  - *13.2.2.1.2* Laboratory Manager
  - *13.2.2.1.3* QA Officer
  - *13.2.2.1.4* Analyst
  - *13.2.2.1.5* Laboratory Technician
- *13.2.2.2* Sample login procedures;
- *13.2.2.3* Laboratory environment monitoring;
  - *13.2.2.3.1* Chemical fume hood flow rates
  - *13.2.2.3.2* Refrigerator temperatures
  - *13.2.2.3.3* Incubator temperatures
  - *13.2.2.3.4* Water bath temperatures
  - *13.2.2.3.5* Laboratory temperatures

13.2.2.4 Maintenance of inventories;
- *13.2.2.4.1* General chemicals
- *13.2.2.4.2* Standard and reference materials
- *13.2.2.4.3* Supplies
- *13.2.2.4.4* Equipment

13.2.2.5 Maintenance of material safety data sheets (MSDS);
13.2.2.6 Dishwashing;
13.2.2.7 Statistical control charting;
13.2.2.8 Corrective action;
13.2.2.9 Maintenance procedures for analytical instrumentation;
- *13.2.2.9.1* Balance calibration check
- *13.2.2.9.2* Detection limits
  - *13.2.2.9.2.1* Gas chromatograph
  - *13.2.2.9.2.2* High performance liquid chromatograph
  - *13.2.2.9.2.3* Atomic absorption spectrophotometer

13.3 Standard operating procedures (SOPs)

Standard operating procedures are documents that describe in detail the specific analytical method of analysis. These documents specify issues related to the performance of various laboratory activities that affect quality. In addition, they ensure consistency in performance resulting in data that meet the established standards.

13.3.1 Standard operating procedures will be developed for each method and maintained in the laboratory.
13.3.2 Standard operating procedures are in writing setting forth study methods that are adequate to insure the quality and integrity of the data generated.
13.3.3 All deviations from standard operating procedures require authorization of the laboratory director and will be documented in the raw data.
13.3.4 Significant changes in established standard operating procedures require written authorization by the laboratory director.
13.3.5 A copy of each SOP is kept in the laboratory available to the analyst.
13.3.6 Each SOP is reviewed at least once per year and revised to reflect changes in laboratory procedures.
13.3.7 Each revision is reviewed, signed and dated by the laboratory director.
13.3.8 Standard operating procedures are established for, but are not limited to the following:
- *13.3.8.1* General laboratory procedures (GP);
- *13.3.8.2* Sampling procedures (SP);
- *13.3.8.3* Chemical analytical procedures (CP);
- *13.3.8.4* Microbiology analytical procedures (MP).

13.4 Controlled documents

Controlled documents are those that have been assigned a unique identifier and issued to a specific person, discipline, or facility. These documents are maintained current by accounting for their date of issue and the revision number. A copy of each version of the document is stored and backed up electronically. Hard copies are also maintained and organized in filing folders and/or loose-leaf binders. The types of controlled documents are:

13.4.1 Quality Assurance Plan (QAP)
13.4.2 Standard Operating Procedures (SOP)
13.4.3 Good Laboratory Practice Procedures (GLP)

13.5 Record keeping procedure

Records include analytical reports, Chain-of-Custody, raw data, data packages, laboratory quality control records, and maintenance records.

13.5.1 Each project is kept in a separate folder containing all preliminary and final reports, client correspondence, Chain-of-Custody, analytical raw data, and any other information pertaining to the project.
13.5.2 Hard copies of electronically maintained data acquisitions and calculations are included in the project folder.
13.5.3 Each project folder is checked for completeness and filed after completion of the project.
13.5.4 All records produced by the laboratory are kept for a minimum of five years.
13.5.5 Confidentiality of all data is strictly maintained and results are only discussed with the client contact person unless other authorization is received.
13.5.6 Results are only released upon completion of analysis (i.e. no preliminary results are given).

14. Control Charts

14.1 Control charts will be used to track parameters listed in specific standard operating procedures.

14.1.1 Control charts will be generated for all temperature logs.
14.1.2 For pesticide and other organic analyses, control charts will be used to track surrogate recovery and calibration check samples as described in each specific method.

14.1.3 For inorganic analyses, control charts will be used to track calibration check samples as described in each specific method.

14.2 Determining control and warning limits

14.2.1 Control and warning limits are calculated as follows using data points from the last 20 analyses:

$$CL = \overline{X} \pm 3\,SD$$

$$WL = \overline{X} \pm 2\,SD$$

where: CL = Control limit at ~99% confidence interval
WL = Warning limit at ~ 95% confidence interval

$\overline{X}$ = Mean
SD = Standard deviation

14.2.2 Control charts are constructed and evaluated using the guidelines in *Standard Methods for Examination of Water and Wastewater*, Part 1020B.7.

14.3 Analyzing Control Charts

14.3.1 Control limits (CL)

14.3.1.1 If one measurement exceeds a CL, the analysis is repeated immediately.

14.3.1.2 If the repeat is within the CL, analyses are continued as normal.

14.3.1.3 If the repeat exceeds the CL, analyses are discontinued and corrective action is taken to determine and correct the problem.

14.3.2 Warning limits (WL)

14.3.2.1 If 2 out of 3 successive points exceed a WL, another sample is analyzed.

14.3.2.2 If the next measurement is less than WL, analyses are continued as normal.

14.3.2.3 If the next measurement exceeds WL, analyses are discontinued and corrective action is taken to determine and correct the problem.

14.3.3 Standard deviations (SD)

14.3.3.1 If 4 out of 5 successive points exceed 1 SD or are in increasing or decreasing order, analysis is performed on one more sample.

14.3.3.2 If the next sample is less than 1 SD or changes the order, then continue analyses without implementing corrective action. Otherwise, analyses are discontinued until corrective action is taken.

14.3.4 Central line

14.3.4.1 If six (6) successive measurements are either above or below the central line, another sample is analyzed.

14.3.4.2 If the next sample is on the other side of the central line, analyses are continued.

14.3.4.3 If the next point is on the same side of the central line, analyses are discontinued until corrective action is taken.

14.3.5 Corrective actions

14.3.5.1 Corrective action must be taken for out-of-control situations detected by control chart analysis.

14.3.5.2 After corrective action is taken, half of the samples are reanalyzed between the last in-control measurement and the out-of-control one.

14.3.6 Monitoring improvement in method precision

14.3.6.1 The control charts will also be used to assess improvements in the method precision.

14.3.6.2 Trends in accuracy and precision will be detected by keeping a running average of the 20 most recent data points.

15. Performance and System Audits

Both external and internal audits are regularly performed in order to monitor the capability and performance of the laboratory.

15.1 External audits

15.1.1 External proficiency test samples are purchased from ELAP and NELAP certified vendors.

15.1.2 Audits of this laboratory quality assurance management plan are regularly made by the U.S. EPA to ensure compliance with QA requirements associated with environmental measurements performed under all Federally funded programs.

15.1.3 Clients may submit blind samples.

15.2 Internal audits

15.2.1 Regular system and performance audits will be performed and documented by the QA Officer and/or the Laboratory Director. The audit includes the following:

15.2.1.1 Verification of proper sample receiving and login procedures.
15.2.1.2 Verification that laboratory documentation is properly maintained.
15.2.1.3 Assessment of results of QC sample analyses.
15.2.1.4 Ensure that laboratory certifications are up to date.

15.2.2 Performance evaluations are routinely and regularly performed.

15.2.2.1 Initial demonstrations of capability must be established for each method and analyte.
15.2.2.2 Any analyst using an analytical method must demonstrate proficiency in the method of interest.
15.2.2.3 Blind check samples are prepared and submitted by the QA Officer or the Laboratory Director on a regular and ongoing basis.

16. Preventive Maintenance

Purchase records and operations manuals will be retained for all major laboratory equipment. Each instrument is maintained according to manufacturer guidelines. Routine preventative maintenance is performed regularly to help reduce instrument failure and improve the reliability of the analyses.

16.1 Performance criteria are established and monitored regularly for each instrument.
16.2 A separate repair and maintenance logbook is kept for each instrument.
16.3 Standard operating procedures are in place describing in sufficient detail the methods, materials, and schedules to be used in the routine inspection, cleaning, maintenance, testing, calibration, and/or standardization of equipment, and shall specify, when appropriate, remedial action to be taken in the event of failure or malfunction of equipment.
16.4 The written standard operating procedures shall designate the person responsible for the performance of each operation (usually the analyst).
16.5 Written records shall be maintained in bound logbooks of all inspection, maintenance, testing, calibrating, and/or standardizing operations. These maintenance logbooks, containing the dates of the operations, describe whether the maintenance operations were routine and followed the written standard operating procedures.

16.6 Analysts are trained to perform routine preventative maintenance and troubleshooting of instruments.

16.7 Operating manuals are readily available in the laboratory.

16.8 Unscheduled repairs performed on equipment as a result of failure and malfunction are also documented in the maintenance logbooks. The nature of the defect, how and when the defect was discovered, and any remedial action taken in response to the defect are recorded.

17. Corrective Action

Corrective action is an ongoing process at *29 Palms Laboratory* to fulfill the philosophy of continually improving the quality and cost of analyses and to enhance customer satisfaction with our product and services. Daily quality control procedures are designed to identify the need for corrective action. The analyst performs most corrective actions and usually follows corrective action protocols that are specified in the methods SOP. In the absence of specific protocols, corrective action will proceed according to the following guidelines:

17.1 Out of control events will be noted and documented when they occur.

17.2 Problems associated with the out of control conditions will be evaluated as soon as possible.

17.3 Initial attempts will be made to rectify the problem during subsequent analyses.

17.4 If initial attempts fail to solve the problems, no further samples will be analyzed until the problems are corrected.

17.5 Samples analyzed during the out of control event will be reextracted or reanalyzed depending on the nature of the problem.

17.6 Clients will be notified if there were unsuccessful attempts to correct problems associated with analyses of their samples.

18. Good Laboratory Practices (GLP)

Whenever possible and applicable, the *29 Palms Laboratory* attempts to adhere to the good laboratory practice standards described in 21 CFR Part 58, 40 CFR Parts 160 and 792.

18.1 Personnel will have the necessary education, training, and experience to perform the assigned laboratory functions.

18.2 A current summary of training, experience and job description for each personnel will be maintained.

18.3 Personnel shall take necessary personal sanitation and health precautions designed to avoid contamination of test, control, and reference samples and analytical systems.

18.4 Personnel engaged in analytical studies will wear clothing appropriate for the duties they perform to prevent microbiological or chemical contamination of analytical samples and systems.

18.5 All personnel are instructed to report any health or medical conditions that may reasonably be considered to have an adverse effect on their performance.

18.6 All analytical data are accurately recorded and verified.

18.7 Unforeseen circumstances that may affect the quality and integrity of the data are noted when they occur, and corrective action is taken and documented.

18.8 Test, control, and reference substances or mixtures are appropriately tested for identity, strength, purity, stability, and uniformity, as applicable.

18.9 Any deviations from SOPs and/or project protocol are reported, and corrective actions are taken and documented.

18.10 All raw data, documentation, protocols, specimens, and final reports are transferred to the archives during or at the close of the project.

18.11 The quality assurance department is responsible for monitoring each study to assure management that the facilities, equipment, personnel, methods, practices, records, and controls are in compliance with the regulations in the quality assurance plan.

18.12 The quality assurance personnel are entirely separate from and independent of the personnel engaged in the performance of laboratory analyses.

18.13 Glassware is cleaned according to the procedure described in the analytical method.

18.14 In the absence of a glassware cleaning procedure, the following is used:

- *18.14.1* Dirty glassware is kept immersed in 2% Liquinox detergent.
- *18.14.2* Each piece of glassware is cleaned by thorough manual brushing.
- *18.14.3* Soap residue is removed by rinsing 10 times in tap water and 10 times in distilled water, and 3 times in reagent water.
- *18.14.4* Washed glassware is allowed to drain and air dry prior to storage in closed cabinets.

18.15 Laboratory water quality specifications are described under section 6.5.

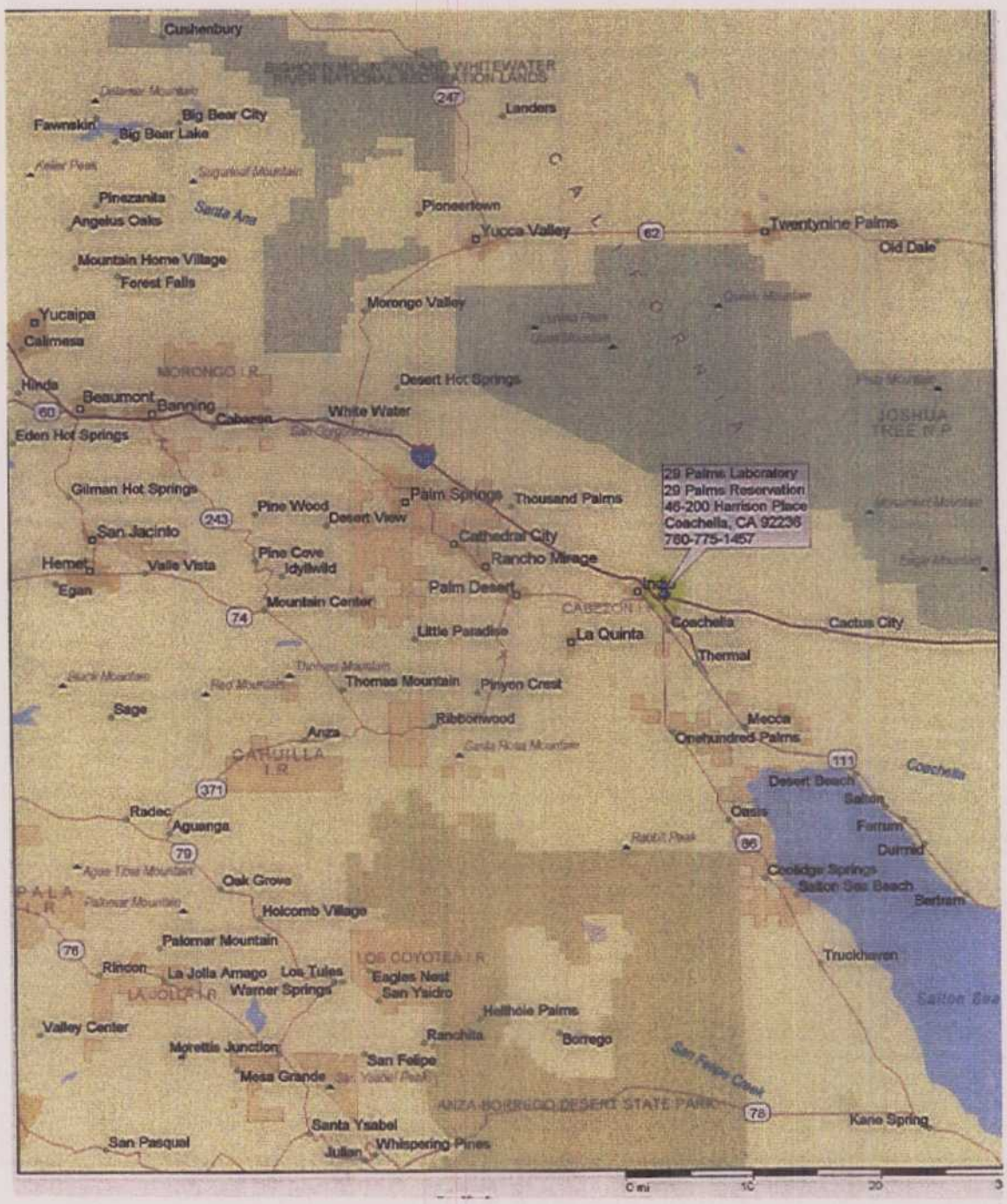
18.16 Fume hood flow rates are checked and recorded daily.

18.17 Local and state safety codes are followed.

18.18 Hazardous wastes are disposed in accordance with regulations (EPA Hazardous Waste Generator ID No. IRC 970716001).

19. **Appendices**

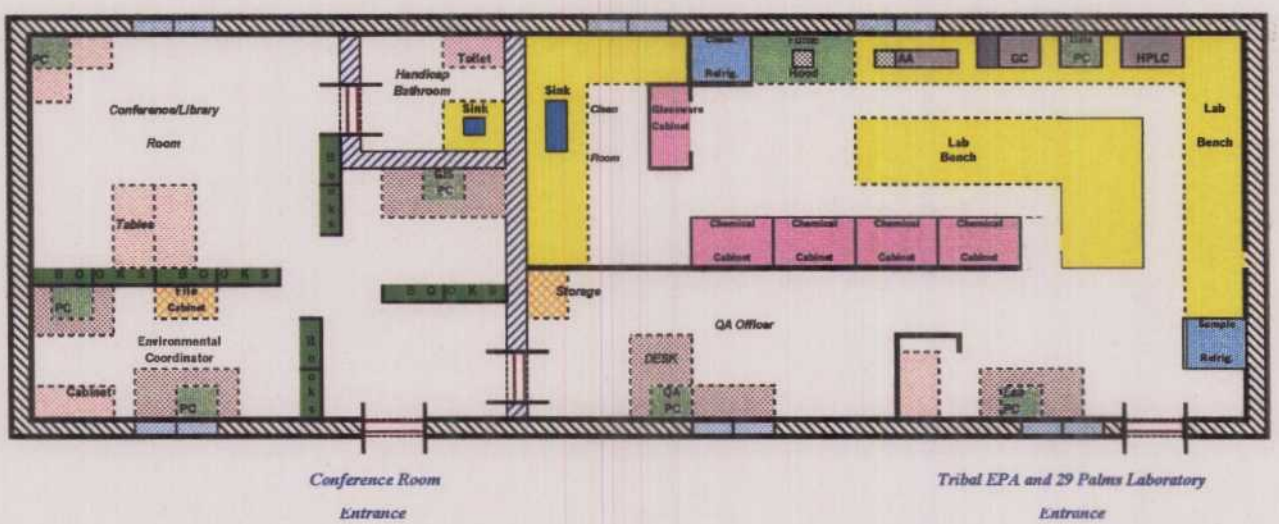
19.1 Map to laboratory



19.2 Laboratory floor plan

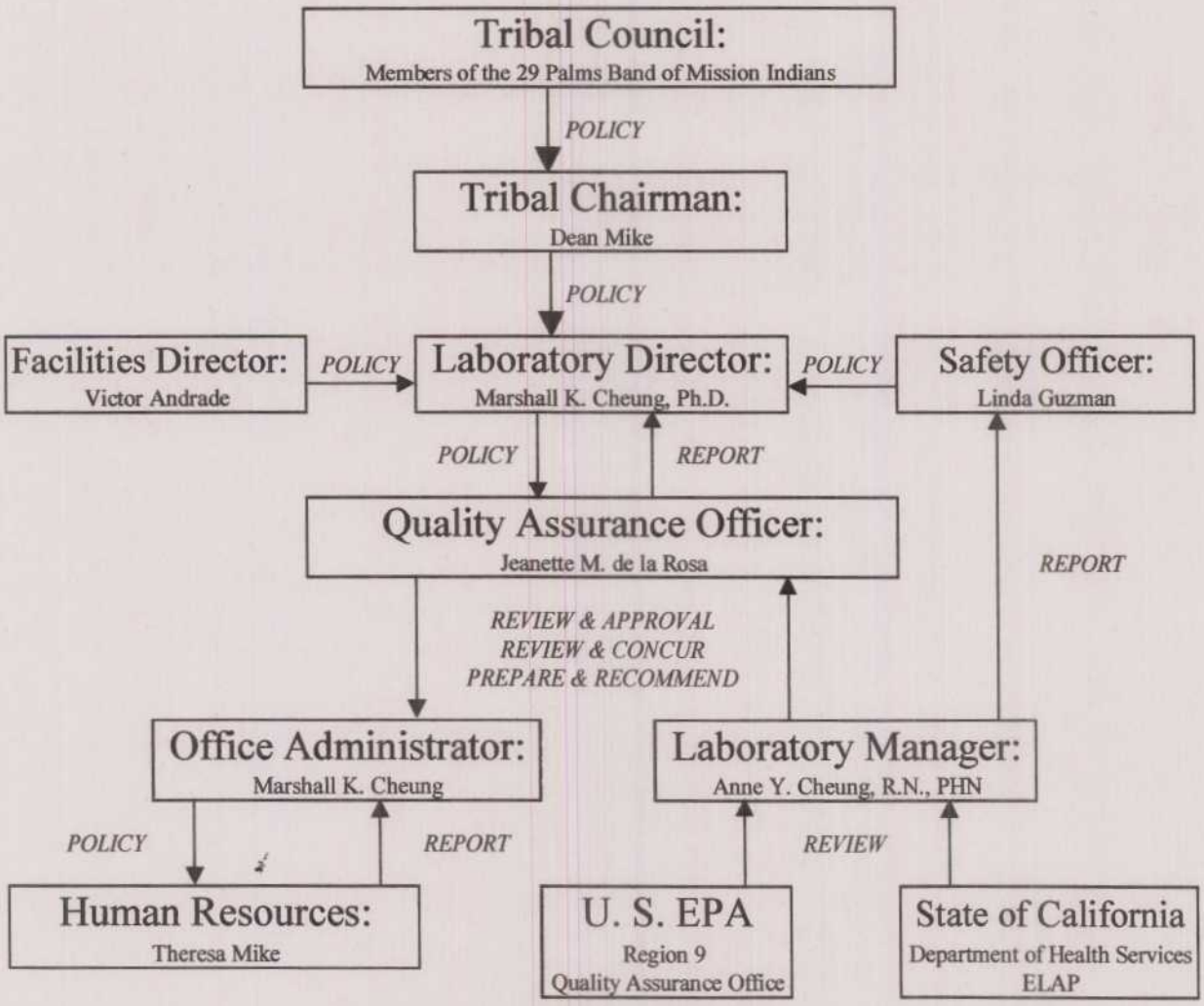
Twenty-Nine Palms Band of Mission Indians

29 Palms Laboratory and Tribal EPA



19.3 Organization chart

29 Palms Laboratory Organization Chart



19.4 Personnel records

19.4.1 Laboratory Director

NAME: **Marshall King Cheung, Ph.D.**

ADDRESS: *29 Palms Laboratory*
46-200 Harrison Place
Coachella, CA 92236

EDUCATION:

Secondary Helix High School
La Mesa, California
Graduated June, 1963

Undergraduate California State University
San Diego, California
B.S. in Microbiology
Graduated February, 1968

Graduate University of Indiana
Indianapolis, Indiana
M.S. in Microbiology
Graduated February, 1971

University of California
Los Angeles, California
Ph.D. in Experimental Pathology
Graduated December, 1982

Postdoctoral University of California
Department of Neuropathology
Neurotoxicology Research
Los Angeles, California
1983-1984

Other National Radio Institute
Home Study Master Course in
Microcomputers and Microprocessors
Completed January, 1984

AWARDS:

NIH Graduate Fellowship
1969-1971

Intra-Science Research Foundation
Graduate Student Research Prize
May 5, 1982

SKILLS:

Environmental surveys
Quality Assurance Program Plan development & review
Quality Management Plan development
Sampling program training & implementation
Environmental impact report review
Federal Indian Environmental Grant Programs
Pesticide screening analysis in water, soil, and food
Environmental analysis of water and soil
Microbiological analysis of water, soil, and food
Research and development
Personnel supervision
Experimental design
Quality Assurance/Quality Control
Data analysis
Grant writing
HPLC analyses
Amino acids
Nucleotides
Carbamate pesticides
GC analyses
Organophosphorus pesticides
Organochlorine pesticides
Purge and trap analyses
EPA methodology 500, 600 & 8000 series
Atomic Absorption
Intrumentation troubleshooting
Cell-free translation
Protein and nucleic acid isolation
Macromolecular analyses
PAGE & agarose gel electrophoresis
Column chromatography
Thin-layer chromatography
Ultracentrifugation techniques
Cellular subfractionation
Radioisotope techniques
Whole cell isolation

Tissue cultures
Enzyme, uptake, and binding assays
Mitochondrial respiration
DNA and RNA synthesis
Animal handling and testing
Brain microdialysis
Computer programming in C, C++, JAVA
Working computer knowledge of:
- Geographical information systems (GIS)
- Word-processing
- Database management
  - Spreadsheets
  - Statistical analyses
  - Accounting software
  - Data acquisition software
  - Networking

WORK EXPERIENCE:

Laboratory Director
29 Palms Laboratory
46-200 Harrison Place
Coachella, CA 92236
1997 – Present

Environmental Coordinator
Tribal EPA
29 Palms Band of Mission Indians
46-200 Harrison Place
Coachella, CA 92236
1997–Present

Environmental Coordinator
Tribal EPA
Augustine Band of Mission Indians
84-481 Avenue 54
Coachella, CA 92236
1998–Present

Director, CDFA and ELAP certified
ALM Analytical Laboratory
77-725 Enfield Lane, Suite 210
Palm Desert, California 92211
1989- 1997

Assistant Professor
Director of Basic Research
Neurosurgery Research Laboratories
Dept. Neurosurgery
University of California
Los Angeles, California
1985-1989

Asst. Research Neuropathologist
Dept. Neuropathology
University of California
Los Angeles, California
1983-1985

Staff Research Associate
Director of Neurochemistry Research
Dr. M.A. Verity
Dept. Neuropathology
University of California
Los Angeles, California
1972-1982

Head Laboratory Technician
Lipid Biochemistry
Dr. A.N. Siakotos
Dept. Neuroanatomy
University of Indiana
Indianapolis, Indiana
1968-1971

Laboratory Technician
Lipid Biochemistry
Dr. George Rouser
Dept. Neurobiochemistry
City of Hope
Duarte, California
1968

TEACHING EXPERIENCE: Instructor
Biology and Anatomy
Biology Department
Mount San Antonio Community College
Walnut, California
Fall Semester, 1997

Instructor
Human Anatomy
Science Department
College of the Desert
Palm Desert, California
Spring Semester, 1993
Instructor
Zoology
Science Department
College of the Desert
Palm Desert, California
Spring Semester, 1993

Instructor
Microbiology
Science Department
College of the Desert
Palm Desert, California
Summer, 1993

Assistant Professor
Dept. Neurosurgery
University of California
Los Angeles, California
1985-1990

Laboratory Instructor
Dept. Pathology
University of California
Los Angeles, California
1982-1985

Laboratory Instructor
AWU Summer Research Program
University of California
Los Angeles, California
1974-1985

Teaching Assistant
Student Pathology Microlab
Dept. Pathology
University of California
Los Angeles, California
1977-1981

Teaching Assistant
Nursing Microbiology
University of Indiana
Indianapolis, Indiana
1970

PUBLICATIONS:

- Cheung, M.K. and R.C. Bockrath (1970) "On the specificity of UV mutagenesis in E. coli." Mut. Res. 10, 521-523.
- Cheung, M.K. (1971) "The effect of postirradiation environment upon the specificity of ultraviolet mutagenesis." Masters Thesis, University of Indiana, 1971.
- Bockrath, R.C. and M.K. Cheung (1973) "The role of nutrient broth supplementation in UV mutagenesis of E. coli." Mut. Res. 19, 23-32.
- Verity, M.A., J. Brown, and M. Cheung (1974) "Mitochondrial conformation and swelling - contraction reactivity during early liver regeneration." Am. J. Path. 74, 241-258.
- Verity, M.A., W.J. Brown, and M. Cheung (1975) "Organic mercurial encephalopathy: In vivo and in vitro effects of methyl mercury on synaptosomal respiration." J. Neurochem. 25, 759-766.
- Verity, M.A., W.J. Brown, M. Cheung, H. Huntsman, and R. Smith (1976) "Effect of neonatal hypothyroidism on cerebral and cerebellar synaptosome development." J. Neurosci. Res. 2, 323-335.
- Verity, M.A., W.J. Brown, M. Cheung, and G. Czer (1977) "Methyl mercury inhibition of synaptosome and brain slice protein synthesis: In vivo and in vitro studies." J. Neurochem. 29, 673-679.
- Verity M.A., W.J. Brown, M.K. Cheung, and G.T. Czer (1977) "Thyroid hormone inhibition of synaptosome amino acid uptake and protein synthesis." J. Neurochem. 29, 853 - 858.

- Verity, M.A., W.J. Brown, and M.K. Cheung (1979) "On the mechanism of ouabain inhibition of synaptosome protein synthesis." J. Neurochem. 32, 1295-1301.
- Weindruck, R.H., M.K. Cheung, M.A. Verity, and R.L. Walford (1980) "Modification of mitochondrial respiration by aging and dietary restriction." Mech. Ageing and Dev. 12, 375-392.
- Verity, M.A., W.J. Brown, and M. Cheung (1980) "Isolation of ribosome containing synaptosome subpopulation with active in vitro protein synthesis." J. Neurosci. Res. 5, 143-153.
- Verity, M.A., M.K. Cheung, and W.J. Brown (1981) "Studies on valinomycin inhibition of synaptosome fraction protein synthesis." Biochem. J. 196, 25-32.
- Cheung M. and M.A. Verity (1981) "Methyl mercury inhibition of synaptosome protein synthesis: Role of mitochondrial dysfunction." Environ. Res. 24, 286-298.
- Cheung, M.K. (1982) "Experimental methyl mercury encephalopathy: Possible mechanisms of mercurial perturbation of rat brain protein synthesis." Ph.D. Dissertation, Dept. Pathology, UCLA.
- Verity, M.A., W.J. Brown, and M. Cheung (1983) "Failure of atractyloside to inhibit intrasynaptosomal mitochondrial energy transduction." Neurochem. Res. 8, 159-166.
- Cheung M.K. and M.A. Verity (1983) "Experimental methyl mercury encephalopathy: Similar in vivo and in vitro perturbation of brain cell-free protein synthesis." Exp. Mol. Path. 38, 230-242.
- Verity M.A., C.F. Tam, M.K. Cheung, D.C. Mock, and R.L. Walford (1983) "Delayed phytohemagglutinin-stimulated production of adenosine triphosphate by aged human lymphocytes: Possible relation to mitochondrial dysfunction." Mech. Ageing and Dev. 23, 53-65.
- Sarafian T., M. Cheung, and M.A. Verity (1984) "In vitro methyl mercury inhibition of protein synthesis in neonatal cerebellar perikarya. " Neuropath. Appl. Neurobiol. 10, 85-100.
- Cheung M.K. and M.A. Verity (1985) "Experimental methyl mercury neurotoxicity: Locus of mercurial inhibition of brain protein synthesis in vivo and in vitro." J. Neurochem. 44, 1799-1808.
- Cheung M.K. (1989) "The Specificity of Glutamate Inhibition of Protein Synthesis in Synaptosomal Fractions From Rat Cerebral Cortex." Neurochem. Int. 15, 293 - 300.

ABSTRACTS:

- Cheung M.K. (1970) "Specificity of ultraviolet mutagenesis in Escherichia coli." Bact. Proc., p. 39.
- Cheung M.K. and R.C. Bockrath (1971) "The effect of postirradiation rate of protein synthesis on UV mutagenesis." Biophys. Abs., p. 307a.
- Verity M.A., G. Czer, M. Cheung, and W.J. Brown (1974) "Organic mercurial encephalopathy: A defect in synaptosome protein synthesis." Am. J. Path. 74:3 8a.

- Verity M.A., W.J. Brown, M. Cheung, and G. Czer (1975) "Paradoxical inhibitions of synaptosomal protein synthesis by thyroid hormone." Trans. Am. Soc. Neurochem. 6:217, 1975.
- Verity M.A., W.J. Brown, M. Cheung, and R.L. Smith (1975) "Cerebellar Development in Experimental hypothyroidism: Synaptosome protein and DNA synthesis." Bull. L.A. Neurol. Soc. 40:40-41.
- Verity M.A., W.J. Brown, M. Cheung, and G. Czer (1975) "Organic mercury encephalopathy: Induced defects in synaptosome respiration and protein synthesis." Proc. VIIth Internat. Congr. Neuropath., pp. 161-365.
- Verity M.A., W.J. Brown, M. Cheung, and H. Huntsman (1976) "Mercuric encephalopathy: Induced synaptosome protein and DNA synthetic defects." Am. J. Path. 82:3 9a.
- Verity M.A., W.J. Brown, C. Battie, and M. Cheung (1976) "Neonatal hypothyroidism." Trans. Am. Soc. Neurochem. 7:93.
- Verity M.A., M. Cheung, and G. Czer (1976) "Cation modulation of amino acid uptake and incorporation into synaptosomes." Fed. Amer. Soc. Exp. Biol. 60th Annual Meeting, p. 80.
- Verity M.A., M. Cheung, and J. Latta (1977) "Characterization of ouabain inhibition of synaptosome protein synthesis." Trans. Am. Soc. Neurochem. 8:216.
- Cheung M., J. Latta, and J. Latta (1977) "Nucleoside incorporation into synaptosome fraction RNA and DNA: Effects of selective inhibitors." Trans. Am. Soc. Neurochem. 8:218.
- Verity M.A., W.J. Brown and M. Cheung (1978) "Organic mercurial encephalopathy: In vivo and in vitro studies of amino acid and nucleoside incorporation into synaptosome fraction protein, RNA, and DNA." V111th Internat. Congr. Neuropath.
- Cheung M. and M.A. Verity (1979) "Mechanisms of methyl mercury inhibition of synaptosome protein synthesis." Trans. Am. Soc. Neurochem. 10:62.
- Verity M.A. and M.K. Cheung (1980) "Valinomycin inhibition of synaptosome fraction protein synthesis." Trans. Am. Soc. Neurochem. 11:95.
- Tam C.F., M.K. Cheung, D.C. Mock, M.A. Verity, and R.L. Walford (1980) "Energy charge and adenine nucleotide content in peripheral T-cells from young, normal aged, SLE, and Down's subjects." Proc. Gerontol. Soc.
- Verity M.A. and M. Cheung (1981) "Synaptosome membrane modulation of respiration: Absence of atractylate effect." Trans. Am. Soc. Neurochem. 12:251.
- Verity M.A., M. Cheung, and W.J. Brown (1982) "Neonatal hypothyroid mediated post-transcriptional defect in brain protein synthesis." Trans. Am. Soc. Neurochem, 13:156.
- Cheung M., M.A. Verity, P. Nguyen, and Y. Lee (1982) "Methyl mercury neurotoxicity: In vivo and in vitro similarities in protein synthetic defect." Trans. Am. Soc. Neurochem. 13:252.
- Sarafian T., M.K. Cheung, and M.A. Verity (1983) "Inhibition of granule cell protein synthesis by methyl mercury." Trans. Am. Soc. Neurochem. 14:214.

- Cheung M.K. and M.A. Verity (1983) "Mechanism of methyl mercury perturbation of rat brain protein synthesis." Trans. Am. Soc. Neurochem. 14:214.
- Verity M.A., M. Cheung, and W.J. Brown (1983) "Experimental Minamata disease: Early defect in elongation state of brain protein synthesis." AANP Abstr.
- Cheung M.K., K. Tachiki, and M.A. Verity (1985) "Selective loss of brain histidyl- and arginyl- tRNA in methyl mercury neurotoxicity." Proc. Int. Soc. Neurochern.
- Cheung M.K. (1986) "Glutamate neurotoxicity in ischemic brain injury". UCLA Interdepartmental Conference, School of Medicine.
- Gade G.F., M.K. Cheung, D.P. Becker, and M.A. Verity (1986) "Concussive inhibition of in vitro protein synthesis in rat brain." X Int. Congr. Neuropathol., Sweden.
- Frazee J., P. La Haye, S. Jordan, M.K. Cheung, P. Dwan, N. Martin, D.P. Becker, R. Jones, and Bivens (1986) "Diltiazem inhibits stroke in a primate model of middle cerebral artery occlusion." West. Neurol. Soc., Hawaii.
- Dwan P., N. Martin, J. Frazee, and M.K. Cheung (1987) "Neurotoxicity of glutamate in stroke." S. Calif Ch. Amer. Col. Surg., Santa Barbara.
- Martin N., M.K. Cheung, T. Reves, and A. Darkins (1987) "Direct neurotoxic effects of blood fractions." AANS, Dallas.
- Martin N., M.K. Cheung, J. Frazee, and D.P. Becker (1987) "Neuronal protection in vitro: Effect of hypothermia and a calcium channel blocker on isolated 'ischemic' rat retina." AANS, Dallas.
- Verity M.A., V. Mah, D. Becker, M. Cheung, and G. Gade (1987) "Post-Concussive Axonal Injury in the Rat Brainstem: Morphometric and Ultrastructural Analysis." AANP, Los Angeles.
- Cheung M.K., B. Quintana, T. Krekorian, N. Martin, R. Singh, and D. Becker (1987) "A non-excitatory neurotoxic action of the excitatory neurotransmitter glutamate?" ASN-ISN Joint Meeting, Caracus, Venezuela.
- Gade G.F., A. Alves, P. S. Dwan, M.K. Cheung, M.A. Verity, and D.P. Becker (1987) "Inhibition of in vitro protein synthesis in rat cerebral cortex following fluid-percussion brain injury." Soc. Neurosci. 17th Annual Meeting, New Orleans, LA.
- Cheung M.K., A. Alves, Y. Katayama, and D.P. Becker (1988) "Excitotoxic Theory of Concussive Brain Injury," Amer. College of Surgeons, Southern Calif Chapter Annual Meeting, Newport Beach, Ca.
- Katayama Y., M. Cheung, P. Madsen, and D. Becker (1988) "Excitatory Amino Acids Mediate an Increase in Extracellular Potassium Following Concussive Brain Injury in the Rat Hippocampus", An International Symposium, Cellular and Molecular Correlates of Central Nervous System Trauma, North Texas State University, Denton, Texas.
- Katayama Y., M. Cheung, A. Alves, and D. Becker (1988) "Effects of Experimental Concussive Brain Injury on Extracellular Ion Concentration of the Hippocampus as Monitored by Microdialysis." AANS, Toronto.
- Verity M.A., M. Cheung, and T. Sarafian (1989) "Biochemical Mechanisms of Methyl Mercury Neurotoxicity." NIEHS Conference.

19.4.2 Laboratory Manager

NAME: **Anne Y. Cheung, R.N., PHN**

ADDRESS: *29 Palms Laboratory*
46200 Harrison Place
Coachella, Ca. 92236

SUMMARY OF QUALIFICATIONS:

- Eight years experience as environmental lab co-director and lab technician.
- Over 25 years of extensive and diversified background as a staff/office nurse specializing in medical and surgical activities in hospitals, doctors' offices and clinics.
- Excellent interpersonal communication skills...efficient with timely completion of assigned projects.
- Past duties encompass the following areas of responsibility:
  - ⇒ Office management, billing, order office supplies
  - ⇒ Laboratory technician: sample preparation, reagent & media preparation, laboratory dishwashing, order lab supplies and equipment, laboratory inventory
  - ⇒ General medical office support functions, i.e., customer/patient relations such as: interviewing, reviewing and diagnosing symptoms, schedule appointments, answer phones, handle inquiries, research files, light typing, and other general office.
  - ⇒ Back office duties; vital signs, EKG's, CXR's treadmills, Holter monitors, Pulmonary function testing, injections, phlebotomy, patient teaching, run urinalysis, run protimes & CBC's.
  - ⇒ Hospital duties; total patient care of medical & surgical patients, monitoring of vital signs, charting, writing & updating care plans, administration of oral, IV, parenteral, rectal, ear, eye medications, blood transfusions, hyperalimentation, drains nasal gastric tubes, gastrostomy tube feedings & irrrigations, wound care, colostomy care, Broviac & Hickman care, assisted MD with pelvic exams, sigmoidoscopies, liver biopsies, spinal taps, chest tube insertions & cardiac arrests.
  - ⇒ Head nurse in a five-doctor practice; relief charge in a three-doctor office; relief charge in a hospital setting under stressful and otherwise timely conditions.
  - ⇒ Supervisory, including training, workload scheduling, and performance evaluating medical and general office staff.

EDUCATION: California State University
Los Angeles, California
B.S. Degree in Nursing
1973

LICENSES: Registered Nurse - State of California
Public Health Certificate

WORK EXPERIENCE:

1998-present
Laboratory Manager
29 Palms Laboratory
46-200 Harrison Place
Coachella, CA 92236

1998-2000
Quality Assurance Officer
29 Palms Laboratory
46-200 Harrison Place
Coachella, CA 92236

1998-Present
Assistant Environmental Coordinator
Tribal EPA
29 Palms Band of Mission Indians
46-200 Harrison Place
Coachella, CA 92236

1998-1999
Assistant Environmental Coordinator
Tribal EPA
Augustine Band of Mission Indians
84481 Avenue 54
Coachella, CA 92236

8/89-97
Co-Director and Laboratory Manager
ALM Analytical Laboratory
77-725 Enfield Lane, Suite 220
Palm Desert, Ca. 92211

7/90 -6/98
Home Health Nurse
Desert Hospital Home Health
P.O. Box 2053
Palm Springs, Ca. 92263

8/88 -8/89
Office Nurse
Physician's Clinic
Stop Smoking Clinic
465 N. Roxbury Dr.
Beverly Hills, Ca. 90210

8/87 - 12/87	Office Nurse Back Office Head Nurse Harvey Alpern, M.D. (Cardiology) Meldon Levy, M.D. (Cardiology) Michael Chaikin, M.D. (Cardiology) Eugene Fishman, M.D. (Internal Medicine) George Gourrich, M.D. (Internal Medicine) Century City, CA. 90067
1984-1987	Office Nurse Nobuyuki Kawata, M.D. (Cardiology) Jon Kobashigawa, M.D. (Cardiology) Jaime Moriguchi, M.D. (Cardiology) Inglewood, CA. 90301
1973-1984	Staff Nurse – Medical (1973-1979) Staff Nurse - Surgical (1974-1984) UCLA Medical Center Westwood, CA.
1969-1972	Inventory Clerk Office Clerk-Credit Robinson's Department Store Los Angeles, CA

19.4.3 Quality Assurance Officer

Name: **Jeanette M. de la Rosa**

Address: 29 Palms Laboratory
46-200 Harrison Place
Coachella, CA 92236

Education: *California Polytechnic State University, San Luis Obispo*
Bachelor of Science in Microbiology, 1998
Minor in Biotechnology

Work History:

Tribal EPA and 29 Palms Laboratory
Twenty Nine Palms Band of Mission Indians
Coachella, CA

Quality Assurance Officer	2000 - present
Laboratory Technician	1999 – 2000
Environmental Technician	1999 – 2000

San Luis Obispo County Health Department Laboratory
San Luis Obispo, CA

Student Intern	Jan – Oct. 1998

City of Brawley Public Works Department
Brawley, CA

Engineering Aid	June-Sept. 1992, 1994

Unocal Geothermal Division, Imperial District
Calipatria, CA

Laboratory Assistant	June-Sept. 1991

U.S. Department of Agriculture, Irrigated Desert Research Station
Brawley, CA

Laboratory Assistant/ Biological Aid	June-Sept. 1989, 1990

Experience: Quality Assurance/Quality Control Principles
Grant proposal preparation
Haz Mat First Responder Awareness
Inorganic Chemical Analyses
Physical Property Analyses
Microbiological Analyses

19.5 ELAP certificate and list of approved fields of testing and analytes

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES

ENVIRONMENTAL LABORATORY CERTIFICATION

is hereby granted to

TWENTY NINE PALMS LABORATORY

46-200 HARRISON PLACE

COACHELLA, CALIFORNIA

to conduct analyses of environmental samples as specified in the "List of Approved Fields of Testing and Analytes" which accompanies this Certificate.

This Certificate is granted in accordance with provisions of Section 1010, et seq. (New Section 100825) of the Health and Safety Code.

Certificate No.: **2337**

Expiration Date: **11/30/2000**

Issued on: **11/24/1998**
at Berkeley, California,
subject to forfeiture or revocation.

George C. Kulasingam, Ph.D.
Manager
Environmental Laboratory Accreditation Program

CALIFORNIA DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM
List of Approved Fields of Testing and Analytes

TWENTY NINE PALMS LABORATORY		**Certificate No.**	**2337**
46-200 HARRISON PLACE	PHONE No. (760) 775-1457	Expiration Date	11/30/2000
COACHELLA, CA	COUNTY RIVERSIDE		

13 Organic Chemistry of Hazardous Waste (excluding GC/MS)

- 13.11B EPA Method 8141A
- 13.25B EPA Method 8081 Organochlorine Pesticides only

16 Wastewater Inorganic Chemistry, Nutrients and Demand

- 16.17 Magnesium
- 16.18 Nitrate
- 16.23 pH
- 16.25 Phosphate, ortho
- 16.28 Residue, Total
- 16.29 Residue, Filterable (Total Dissolved Solids)
- 16.35 Specific Conductance
- 16.36 Sulfate

19 Organic Chemistry of Wastewater (excluding GC/MS)

- 19.12 EPA Method 632
- 19.16 EPA Method 608 Chlorinated Pesticides only

As of 11/25/1998, this list supersedes all previous lists for this certificate number.

Page 1 of 1

19.6 Containers, preservation techniques, and holding times for aqueous matrices

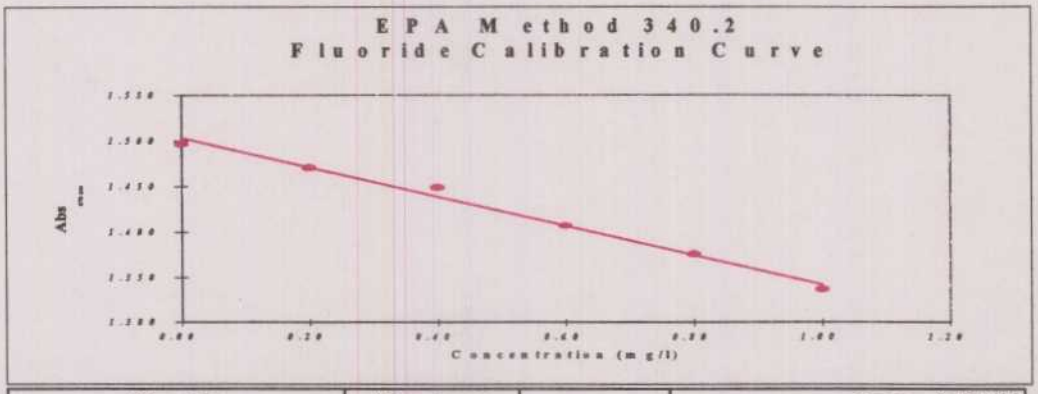
CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES FOR AQUEOUS MATRICES

Analysis	EPA Method	Recommended Container	Preservation	Maximum holding time	Minimum Volume Required for Analysis
Field Analyses:					
Specific conductance	120.1	Teflon or Plastic	None required	None	100 mL
Hydrogen ion (pH)	150.1	Teflon or Plastic	None required	None	25 mL
Inorganic Analyses:					
Chloride	325.3	Teflon or Plastic	Cool to 4°C	28 days	50 mL
Fluoride	340.2	Teflon or Plastic	HNO_3 to pH < 2	28 days	300 mL
Nitrate	352.1	Teflon or Plastic	Cool to 4°C/H_2SO_4 to pH < 2	48 hours	100 mL
Phosphate, Ortho	365.3	Teflon or Plastic	Cool to 4°C	48 hours	100 mL
Sulfate	375.4	Teflon or Plastic	Cool to 4°C	28 days	50 mL
Metal Analyses:					
Chromium VI	218.3	Plastic or Glass	Cool to 4°C	24 hours	1000 mL
Mercury	245.1	Plastic or Glass	HNO_3 to pH < 2	28 days	1000 mL
Metals, except Chromium and Mercury	200 Series	Plastic or Glass	HNO_3 to pH < 3	6 months	1000 mL
Organic Analyses:					
Organochlorine Pesticides and other Chlorinated Hydrocarbons	608, 8081A	Glass with Teflon-lined cap	Cool to 4°C	7 days until extraction 40 days after extraction	1000 mL
Organophosphorus Pesticides	8141A	Glass with Teflon-lined cap	Cool to 4°C	7 days until extraction 40 days after extraction	1000 mL
N-Methylcarbamate Pesticides	632, 8318	Glass with Teflon-lined cap	Cool to 4°C	7 days until extraction 40 days after extraction	1000 mL
Microbiology:					
Total Coliform	909A	Sterile Polypropylene or Glass	Cool to 4°C and $Na_2S_2O_3$	6 hours	200 mL
Fecal Coliform	909C	Sterile Polypropylene or Glass	Cool to 4°C and $Na_2S_2O_4$	6 hours	200 mL

19.7 Sample calibrations

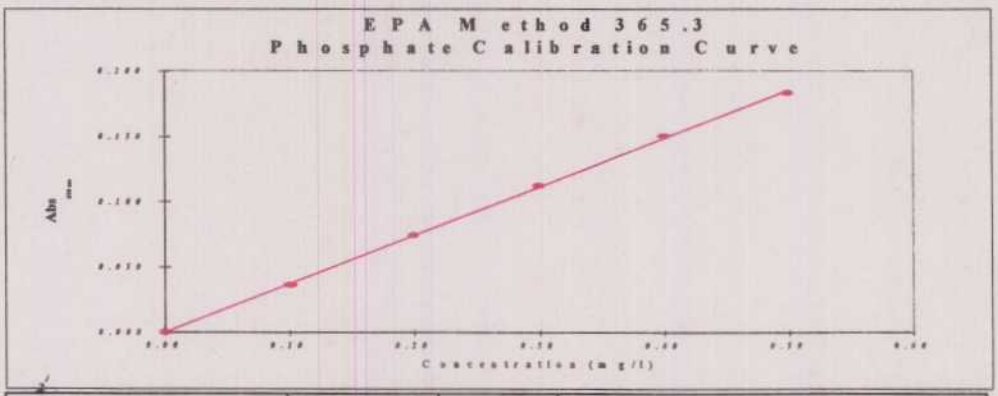
19.7.1 Wet chemistry

19.7.1.1 EPA Method 340.2 – Fluoride



Fluoride Concentration (mg/l)	Absorbance Units (Abs)	RF (Abs/mg/l)		
0.00	1.497	-	*Date:*	08/31/98
0.20	1.471	7.355	*Average RF* =	3.276
0.40	1.449	3.623	*Std. Dev.* =	2.440
0.60	1.407	2.345	*Relative % Std. Dev.* =	74.47
0.80	1.376	1.720	R^2 =	0.991
1.00	1.337	1.337	*m* =	-0.161
			y-intercept =	1.503

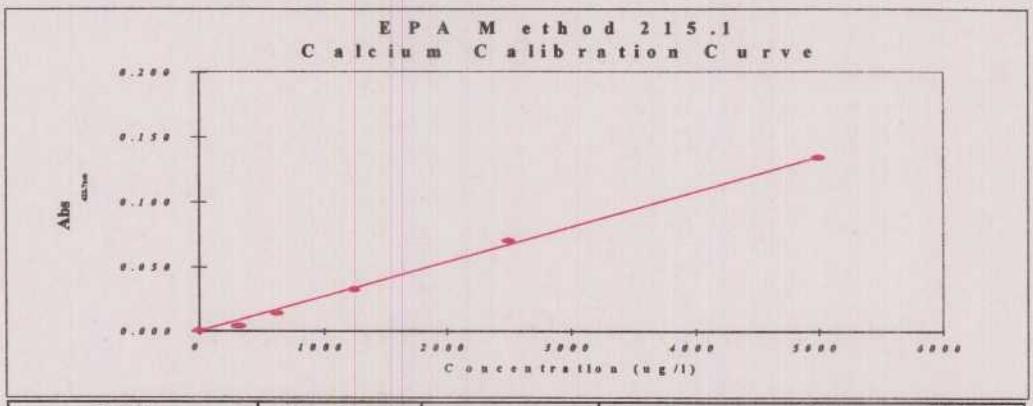
19.7.1.2 EPA Method 365.3 – Orthophosphate



PO_4-P Concentration (mg/l)	Absorbance Units (IU)	RF (IU/mg/l)		
0.00	0.000	-	*Date:*	08/29/98
0.10	0.036	0.360	*Average RF* =	0.370
0.20	0.074	0.370	*Std. Dev.* =	0.007
0.30	0.112	0.373	*Relative % Std. Dev.* =	1.82
0.40	0.150	0.375	R^2 =	1.000
0.50	0.183	0.366	*m* =	0.370
			y-intercept =	0.000

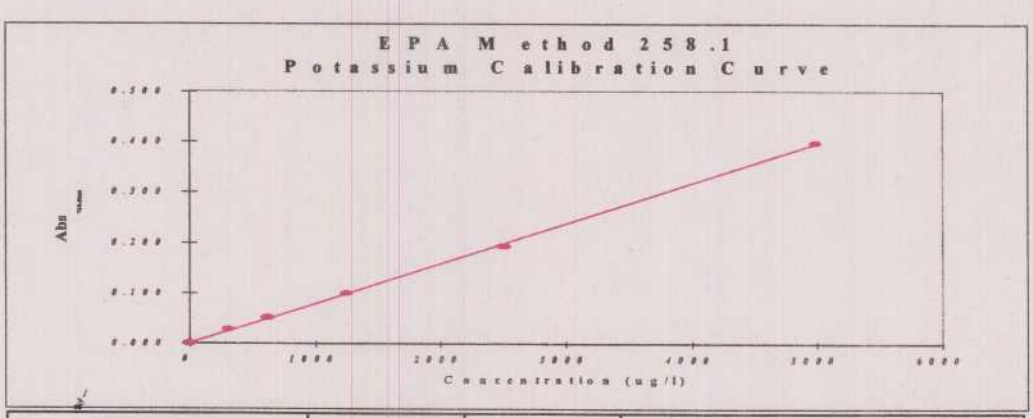
19.7.2 Atomic absorption (AA)

19.7.2.1 EPA Method 215.1 – Calcium



Calcium Concentration *(ug/l)*	Absorbance Units *(Abs)*	RF *(Abs/ug/l)*		
0.0	0.000	-	*Date:*	08/31/98
312.5	0.004	0.0000128	*Average RF =*	0.0000231
625	0.014	0.0000224	*Std. Dev. =*	0.0000061
1250	0.032	0.0000256	*Relative % Std. Dev. =*	26.53
2500	0.070	0.0000280	R^2 =	0.997
5000	0.134	0.0000268	*m =*	0.0000269
			y-intercept =	0.0000000

19.7.2.2 EPA Method 258.1 – Potassium

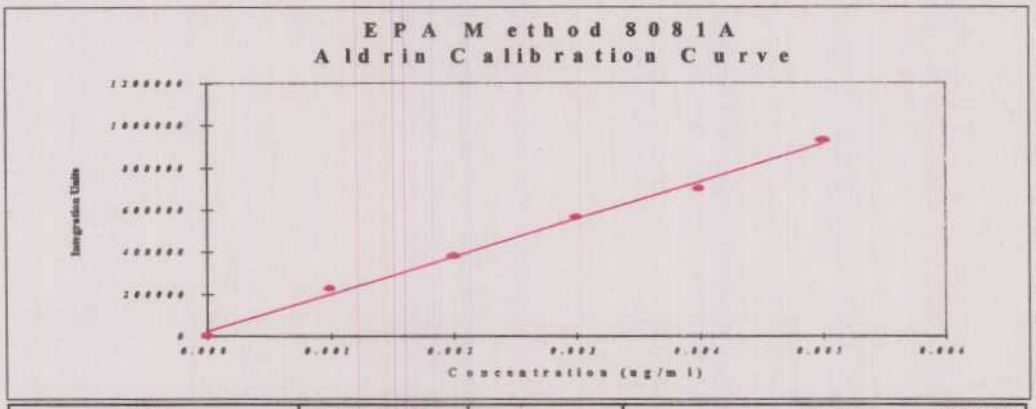


Potassium Concentration *(ug/l)*	Absorbance Units *(IU)*	RF *(IU/ug/l)*		
0.0	0.000	-	*Date:*	01/05/94
312.5	0.029	0.0000928	*Average RF =*	0.0000826
625	0.052	0.0000832	*Std. Dev. =*	0.0000061
1250	0.100	0.0000800	*Relative % Std. Dev. =*	7.40
2500	0.193	0.0000772	R^2 =	1.000
5000	0.398	0.0000796	*m =*	0.0000792
			y-intercept =	0.0000000

19.7.3 Gas chromatography (GC)

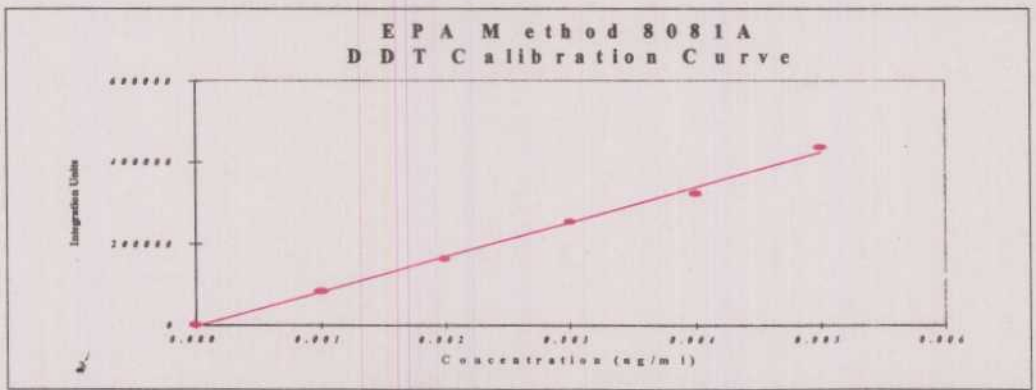
19.7.3.1 EPA Method 8081A – Organochlorine pesticides

19.7.3.1.1 Aldrin



Aldrin Concentration (ug/ml)	Integration Units (IU)	RF (IU/ug/ml)		
			Date:	08/12/98
0.000	0	-	*Average RF =*	193103160
0.001	225149	225149000	*Std. Dev. =*	18934087
0.002	381326	190663000	*Relative % Std. Dev. =*	9.81
0.003	566418	188806000		
0.004	699456	174864000	R^2 =	0.995
0.005	930169	186033800	*m =*	178824514
			y-intercept =	20025

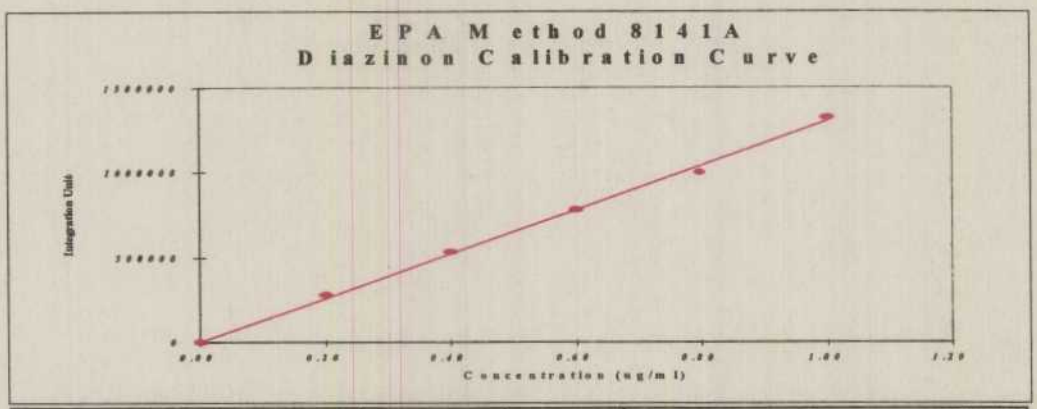
19.7.3.1.2 DDT



DDT Concentration (ug/ml)	Integration Units (IU)	RF (IU/ug/ml)		
			Date:	08/12/98
0.000	0	-	*Average RF =*	83418467
0.001	83225	83225000	*Std. Dev. =*	2690768
0.002	162524	81262000	*Relative % Std. Dev. =*	3.23
0.003	254104	84701333		
0.004	322524	80631000	R^2 =	0.997
0.005	436365	87273000	*m =*	85465771
			y-intercept =	-3874

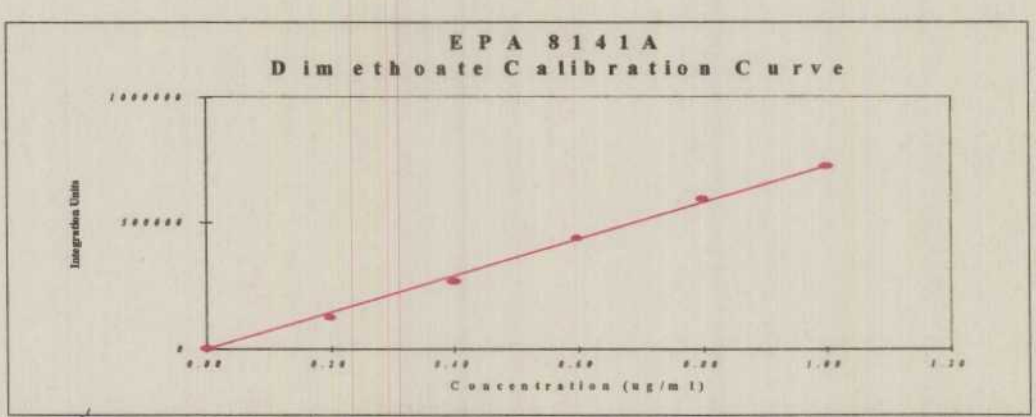
19.7.3.2 EPA Method 8141A – Organophosphorus pesticides

19.7.3.2.1 Diazinon



Diazinon Concentration *(ug/ml)*	Integration Units *(IU)*	RF *(IU/ug/ml)*		
			Date:	10/09/98
0.000	0	-	*Average RF =*	1321537
0.200	279450	1397250	*Std. Dev. =*	53000
0.400	533553	1333883	*Relative % Std. Dev. =*	4.01
0.600	780567	1300945		
0.800	1001116	1251395	R^2 =	0.998
1.000	1324213	1324213	*m =*	1301253
			y-intercept =	0

19.7.3.2.2 Dimethoate

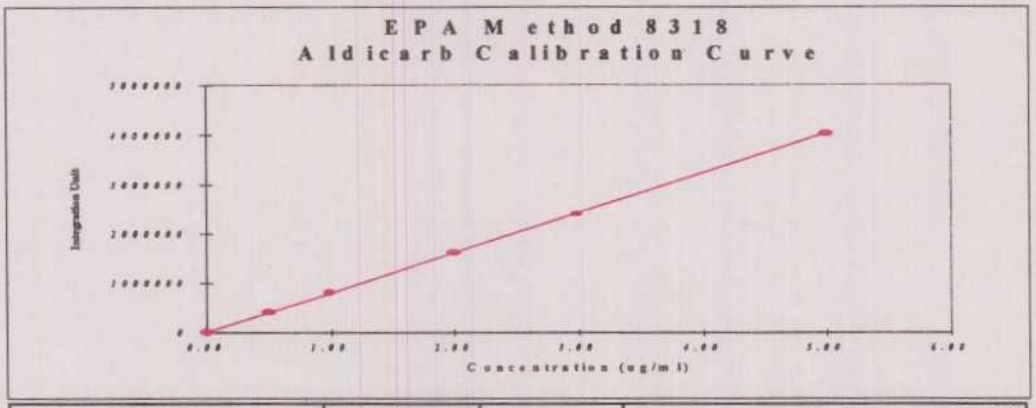


Dimethoate Concentration *(ug/ml)*	Integration Units *(IU)*	RF *(IU/ug/ml)*		
			Date:	10/09/98
0.000	0	-	*Average RF =*	695139
0.200	123703	618515	*Std. Dev. =*	53061
0.400	264408	661020	*Relative % Std. Dev. =*	7.63
0.600	438825	731375		
0.800	592560	740700	R^2 =	0.997
1.000	724084	724084	*m =*	723605
			y-intercept =	0

19.7.4 High performance liquid chromatography (HPLC)

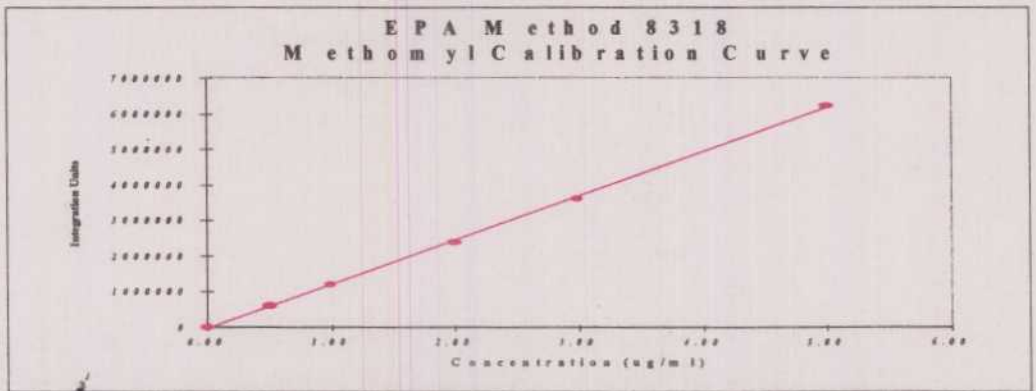
19.7.4.1 EPA Method 8318 – N-Methylcarbamate pesticides

19.7.4.1.1 Aldicarb



Aldicarb Concentration (ug/ml)	Integration Units (IU)	RF (IU/ug/ml)		
			Date:	08/05/98
0.000	0	-	*Average RF* =	810889
0.500	414798	829596	*Std. Dev.* =	11309
1.000	811952	811952	*Relative % Std. Dev.* =	1.39
2.000	1614389	807195		
3.000	2399656	799885	R^2 =	1.000
5.000	4029077	805815	*m* =	803403
			y-intercept =	5123

19.7.4.1.2 Methomyl



Methomyl Concentration (ug/ml)	Integration Units (IU)	RF (IU/ug/ml)		
			Date:	08/05/98
0.000	0	-	*Average RF* =	1217677
0.500	622440	1244880	*Std. Dev.* =	25205
1.000	1199660	1199660	*Relative % Std. Dev.* =	2.07
2.000	2388661	1194331		
3.000	3613106	1204369	R^2 =	0.999
5.000	6225720	1245144	*m* =	1239385
			y-intercept =	-33889

19.8 Sample MDL determination

19.8.1 EPA Method 8081A – Organochlorine pesticides

EPA Method 8081A
Organochlorine Pesticides
Method Detection Limit (MDL) in Water

Instrument: Shimadzu GC-14A
Column: Supelco SPB-608
30 m x 0.25 mm ID
0.25 um film thickness
Cat. No. 2-4103
Lot. No. 7689-03A

Extraction Method: EPA Method 3510C
Extraction Date: 05/23/98
Analysis Date: 05/24/98
Report Date: 05/31/98

Analyst: Marshall K. Cheung, Ph.D.

Pesticides	Spike Amt. (ug/L)	#1 Conc. (ug/L)	#1 % Rec	#2 Conc. (ug/L)	#2 % Rec	#3 Conc. (ug/L)	#3 % Rec	#4 Conc. (ug/L)	#4 % Rec	#5 Conc. (ug/L)	#5 % Rec	#6 Conc. (ug/L)	#6 % Rec	#7 Conc. (ug/L)	#7 % Rec	Ave. Rec %	STD	MDL** (ug/L)
TRIFLURALIN	0.050	0.0200	40.0	0.0273	54.6	0.0452	90.4	0.0342	68.3	0.0417	83.4	0.0240	48.0	0.0424	84.8	67.1	0.0100	0.031
METHYL CHLORPYRIFOS	0.050	0.0384	76.8	0.0433	86.6	0.0333	66.6	0.0447	89.3	0.0474	94.8	0.0390	78.0	0.0449	89.8	83.1	0.0043	0.013
DACTHAL	0.100	0.0738	73.8	0.0962	96.2	0.0732	73.2	0.0997	99.7	0.0979	97.9	0.0850	85.0	0.0915	91.5	88.2	0.0103	0.032
ENDOSULFAN I	0.035	0.0244	69.7	0.0328	93.7	0.0263	75.2	0.0347	99.2	0.0330	94.3	0.0301	86.1	0.0319	91.1	87.0	0.0052	0.016
DDE	0.025	0.0115	46.0	0.0220	88.0	0.0210	84.0	0.0262	104.7	0.0214	85.6	0.0169	67.7	0.0242	96.8	81.8	0.0051	0.016
ENDRIN	0.030	0.0201	67.0	0.0289	96.3	0.0224	74.7	0.0309	103.1	0.0288	96.0	0.0278	92.8	0.0286	95.3	89.3	0.0040	0.013
ENDOSULFAN II	0.015	0.0122	81.3	0.0141	94.0	0.0125	83.1	0.0169	112.9	0.0136	90.7	0.0148	98.4	0.0131	87.3	92.5	0.0016	0.005
DDT	0.025	0.0146	58.4	0.0270	108.0	0.0228	91.3	0.0283	113.1	0.0283	113.2	0.0174	69.6	0.0302	120.8	96.3	0.0063	0.020
ENDRIN ALDEHYDE	0.010	0.0090	90.0	0.0094	94.0	0.0098	98.0	0.0097	96.6	0.0099	99.0	0.0097	97.2	0.0093	93.0	95.4	0.0003	0.001
ENDRIN KETONE	0.010	0.0111	111.0	0.0110	110.0	0.0088	88.2	0.0112	112.0	0.0119	119.0	0.0110	110.4	0.0102	102.0	107.5	0.0063	0.020
PERMETHRIN	0.050	0.0115	23.0	0.0241	48.2	0.0319	63.8	0.0451	90.2	0.0299	59.8	0.0133	26.6	0.0353	70.6	54.6	0.0470	0.148

** *MDL = 3.143 x Standard Deviation*

19.8.2 EPA Method 8141A – Organophosphorus pesticides

EPA Method 8141A
Organophosphorous Pesticides
Method Detection Limit (MDL) in Water

Instrument: Shimadzu GC-14A
Column: J & W Scientific DB-17
15 m x 0.53 mm ID
1 um film thickness
Cat. No. 125-1712
Ser. No. 3824514A

Extraction Method: EPA 3510C
Analysis Date: 05/28/98
Report Date: 05/31/98

Analyst: Marshall K. Cheung, Ph.D.

Pesticides	Spike Amt. (ug/L)	#1 Conc. (ug/L)	#1 % Rec	#2 Conc. (ug/L)	#2 % Rec	#3 Conc. (ug/L)	#3 % Rec	#4 Conc. (ug/L)	#4 % Rec	#5 Conc. (ug/L)	#5 % Rec	#6 Conc. (ug/L)	#6 % Rec	#7 Conc. (ug/L)	#7 % Rec	Ave. Rec %	STD	MDL** (ug/L)
ACEPHATE	0.500	0.631	126.3	0.372	74.4	0.374	74.8	0.650	130.0	0.286	57.2	0.406	81.2	0.777	155.4	99.9	0.1841	0.579
DIAZINON	0.500	0.494	98.8	0.481	96.2	0.412	82.4	0.456	91.2	0.466	93.2	0.482	96.4	0.474	94.8	93.3	0.0269	0.085
DIMETHOATE	0.500	0.476	95.2	0.597	119.4	0.409	81.8	0.358	71.6	0.393	78.6	0.413	82.6	0.450	90.0	88.5	0.0781	0.246
CHLORPYTIFOS	0.500	0.364	72.8	0.420	84.0	0.355	71.0	0.418	83.6	0.418	83.6	0.390	78.0	0.418	83.6	79.5	0.0281	0.088
MALATHION	0.500	0.314	62.7	0.477	95.4	0.435	87.0	0.536	107.2	0.432	86.4	0.319	63.8	0.325	65.0	81.1	0.0877	0.276
NEMACUR	0.500	0.644	128.8	0.535	107.0	0.434	86.8	0.570	114.0	0.499	99.8	0.435	87.0	0.500	100.0	103.3	0.0747	0.235
TPP	0.500	0.504	100.8	0.476	95.2	0.372	74.4	0.630	126.0	0.447	89.4	0.453	90.6	0.515	103.0	97.1	0.0792	0.249

** *MDL = 3.143 x Standard Deviation*

19.8.3 EPA Method 8318 – N-Methylcarbamate pesticides

EPA Method 8318
N-Methylcarbamate Pesticides
Method Detection Limit (MDL) in Water

Instrument: Eldex 8600 Ternary HPLC
Column: Alltech Econosphere C18
150 x 4.6 mm, 5 micron
Cat. No. 287072
Ser. No. A-011189-C

Extraction Method: EPA Method 3510C
Extraction Date: 06/30/98
Analysis Date: 05/27/98
Report Date: 05/31/98

Analyst: Marshall K. Cheung, Ph.D.

Pesticides	Spike Amt. (ug/L)	#1 Conc. (ug/L)	#1 % Recovery	#2 Conc. (ug/L)	#2 % Recovery	#3 Conc. (ug/L)	#3 % Recovery	#4 Conc. (ug/L)	#4 % Recovery	#5 Conc. (ug/L)	#5 % Recovery	#6 Conc. (ug/L)	#6 % Recovery	#7 Conc. (ug/L)	#7 % Recovery	STD	MDL** (ug/L)
METHOMYL	0.500	0.350	70.0	0.550	110.0	0.400	80.0	0.500	100.0	0.350	70.0	0.450	90.0	0.550	110.0	0.0866	0.272
CARBOFURAN	0.500	0.450	90.0	0.450	90.0	0.500	100.0	0.350	70.0	0.450	90.0	0.600	120.0	0.550	110.0	0.0809	0.254
CARBARYL	0.500	0.200	40.0	0.250	50.0	0.450	90.0	0.250	50.0	0.400	80.0	0.800	160.0	0.450	90.0	0.2041	0.642
PROPOXUR	0.500	0.250	50.0	0.150	30.0	0.650	130.0	0.200	40.0	0.200	40.0	0.400	80.0	0.350	70.0	0.1725	0.542
METHIOCARB	0.500	0.200	40.0	0.000	0.0	0.250	50.0	0.450	90.0	0.350	70.0	0.400	80.0	0.350	70.0	0.1520	0.478

** *MDL = 3.143 x Standard Deviation*

19.9 Sample laboratory forms

19.9.1 Log forms

19.9.1.1 Laboratory fume hood air flow

Laboratory Fume Hood Air Flow Log

DATE	**Velocity** ***(ft/min)***	**INITIALS**	**DATE**	**Velocity** ***(ft/min)***	**INITIALS**	**ACCEPTABLE RANGE** ***(ft/min)***
						300 - 400
						300 - 400
						300 - 400
						300 - 400
						300 - 400
						300 - 400
						300 - 400
						300 - 400
						300 - 400
						300 - 400
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						300 - 400
						300 - 400
						300 - 400
						300 - 400
						300 - 400

19.9.1.2 Refrigerator temperature log

REFRIGERATORS TEMPERATURE LOG

DATE	REFRIGERATOR #1 *(SAMPLES)*	REFRIGERATOR #2 *(CHEMICALS)*	ACCEPTABLE RANGE (°C)	INITIALS
			0 - 5	
			0 - 5	
			0 - 5	
			0 - 5	
			0 - 5	
			0 - 5	
			0 - 5	
			0 - 5	
			0 - 5	
			0 - 5	
			0 - 5	
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19.9.1.3 Reagent log

Reagent Log

DATE	EXPIRES	LAB NO.	DESCRIPTION	STOCK CONC.	SOURCE	CAT. NO.	LOT NO.	AMT	CONC.	INIT

19.9.1.4 Calibration standard log

Calibration Standard Log

DATE	EXPIRES	LAB NO.	DESCRIPTION	STOCK CONC.	SOURCE	CAT. NO.	LOT NO.	AMT	CONC.	INIT

19.9.2 Chain-of-Custody

CHAIN OF CUSTODY

Work Order No.:

Client: _____ **Sampler:** _____

Address: _____ **Address:** _____

_____ _____

Telephone: _____ **Fax:** _____ **Telephone:** _____

Contact: _____ **Project No. :** _____

Due Date: ☐ *Regular* ☐ *Rush* *Days:* _____

Lab I.D. No.	Sample I.D. No.	Sample Description	Collected		Grab	Composite	Matrix Type	Preservation	No. of Containers	Type of Containers	Method of Analysis						Remarks	If produce, indicate if it is in the channels of trade.	
			Date	Time														Yes	No

Hazards Associated with Samples: _____ **Disposal Options:** ☐ Return ☐ Disposal by Lab

Sample Conditons: _____ **Temperature:** ☐ Cold ☐ Room (_____ °C) Hold samples to: _____ °C

	Date	Time	Comments
Relinquished by:			
Received by:			
Relinquished by:			
Received by:			
Relinquished by:			
Received by:			

Special Instructions:

Declaration: *I certify that the channels of trade information indicated above is correct.* **Signature:** _____

Distribution: Original accompanies shipment; Copy to client's files

19.9.3 Sample calibration forms

19.9.3.1 N-Methylcarbamate pesticides

Date: 3/8/97

Column: Alltech-150

Ser. No.: 23568

N-Methylcarbamate Pesticides Calibration

MC Cal Mix:	Stock Conc. (ug/ml)	Dil	Conc. (ug/ml)	RT (min)	IU	RF	AVG RF	%RSD	RT WINDOW
Aldoxycarb	20	20.0	1.00	12.25	404835	404835			
	20	25.0	0.80	12.27	320263	400329			
	20	33.3	0.60	12.30	231471	385399			
	20	50.0	0.40	12.49	159434	398585			
	20	100.0	0.20	12.65	88125	440625	405955	5	11.87 - 12.91
Oxamyl	20	20.0	1.00	14.37	529455	529455			
	20	25.0	0.80	14.36	420532	525665			
	20	33.3	0.60	14.41	315635	525532			
	20	50.0	0.40	14.56	216319	540798			
	20	100.0	0.20	14.76	110294	551470	534584	2	13.98 - 15.00
Methomyl	10	20.0	0.50	14.79	555350	1110700			
	10	25.0	0.40	14.79	432885	1082213			
	10	33.3	0.30	14.85	331680	1104494			
	10	50.0	0.20	15.04	235772	1178860			
	10	100.0	0.10	15.26	113689	1136890	1122631	3	14.34 - 15.56
Aldicarb	20	20.0	1.00	22.36	613126	613126			
	20	25.0	0.80	22.36	491398	614248			
	20	33.3	0.60	22.43	367549	611969			
	20	50.0	0.40	22.62	244147	610368			
	20	100.0	0.20	22.89	122900	614500	612842	0	21.85 - 23.21
Propoxur	20	20.0	1.00	24.48	571877	571877			
	20	25.0	0.80	24.48	436772	545965			
	20	33.3	0.60	24.51	342178	569726			
	20	50.0	0.40	24.66	251776	629440			
	20	100.0	0.20	24.89	114014	570070	577416	5	24.07 - 25.13
Carbofuran	20	20.0	1.00	25.07	500467	500467			
	20	25.0	0.80	25.06	373857	467321			
	20	33.3	0.60	25.09	291741	485749			
	20	50.0	0.40	25.23	218111	545278			
	20	100.0	0.20	25.50	101416	507080	501179	6	24.63 - 25.75
Carbaryl	20	20.0	1.00	26.61	640220	640220			
	20	25.0	0.80	26.62	512329	640411			
	20	33.3	0.60	26.57	382054	636120			
	20	50.0	0.40	26.91	250254	625635			
	20	100.0	0.20	27.15	137945	689725	646422	4	26.02 - 27.53
Methiocarb	40	20.0	2.00	32.06	664397	332199			
	40	25.0	1.60	32.06	525114	328196			
	40	33.3	1.20	31.91	399122	332269			
	40	50.0	0.80	32.03	271863	339829			
	40	100.0	0.40	32.22	137968	344920	335483	2	31.72 - 32.39
BDMC (Surrogate)	38	20.0	1.90	32.55	579462	304980			
	38	25.0	1.52	32.74	475925	313109			
	38	33.3	1.14	32.64	416176	364702			
	38	50.0	0.76	32.71	303532	399384			
	38	100.0	0.38	32.90	131798	346837	345802	11	32.32 - 33.10

19.9.3.2 Organophosphorus pesticides

Date: 1/5/94

Column: DB-17

Ser. No.: 12568

Organophosphorus Pesticides Calibration

MC Cal Mix:	Stock Conc. (ug/ml)	Dil	Conc. (ug/ml)	RT (min)	IU	RF	AVG RF	%RSD	RT WINDOW
DDVP	10	20.0	0.500	6.31	440050	880100			
	10	25.0	0.400	6.31	357687	894218			
	10	33.3	0.300	6.32	263433	877232			
	10	50.0	0.200	6.32	185048	925240			
	10	100.0	0.100	6.33	98210	982100	911778	5	6.29 - 6.34
Methamidophos (Monitor)	10	20.0	0.500	7.18	381682	763364			
	10	25.0	0.400	7.19	313269	783173			
	10	33.3	0.300	7.20	220960	735797			
	10	50.0	0.200	7.21	188335	941675			
	10	100.0	0.100	7.22	128206	1282060	901214	25	7.15 - 7.25
Mevinphos-A (Phosdrin-A)	10.5	20.0	0.525	9.11	489047	931518			
	10.5	25.0	0.420	9.11	404499	963093			
	10.5	33.3	0.315	9.11	302240	958533			
	10.5	50.0	0.210	9.12	228791	1089481			
	10.5	100.0	0.105	9.13	115551	1100486	1008622	8	9.09 - 9.14
Mevinphos-B (Phosdrin-B)	4.5	20.0	0.225	9.38	245568	1091413			
	4.5	25.0	0.180	9.38	194628	1081267			
	4.5	33.3	0.135	9.38	137709	1019047			
	4.5	50.0	0.090	9.39	95928	1065867			
	4.5	100.0	0.045	9.42	46446	1032133	1057945	3	9.34 - 9.44
Acephate (Orthene)	15	20.0	0.750	9.95	480478	640637			
	15	25.0	0.600	9.94	362793	604655			
	15	33.3	0.450	9.93	320301	711068			
	15	50.0	0.300	9.94	213252	710840			
	15	100.0	0.150	9.97	100453	669687	667377	7	9.90 - 9.99
Diazinon	10	20.0	0.500	12.70	841273	1682546			
	10	25.0	0.400	12.70	670337	1675843			
	10	33.3	0.300	12.70	507079	1688573			
	10	50.0	0.200	12.70	350694	1753470			
	10	100.0	0.100	12.72	175471	1754710	1711028	2	12.68 - 12.73
Dimethoate (Cygon)	10	20.0	0.500	13.23	327102	654204			
	10	25.0	0.400	13.24	278199	695498			
	10	33.3	0.300	13.23	191179	636626			
	10	50.0	0.200	13.24	159784	798920			
	10	100.0	0.100	13.23	81969	819690	720988	12	13.22 - 13.25
Met-Chlorpyriphos	10	20.0	0.500	13.92	576816	1153632			
	10	25.0	0.400	13.91	485172	1212930			
	10	33.3	0.300	13.90	343703	1144531			
	10	50.0	0.200	13.91	259699	1298495			
	10	100.0	0.100	13.92	131572	1315720	1225062	6	13.89 - 13.94
Chlorpyriphos (Dursban)	10	20.0	0.500	14.62	1003748	2007496			
	10	25.0	0.400	14.62	837115	2092788			
	10	33.3	0.300	14.62	625844	2084061			
	10	50.0	0.200	14.63	445387	2226935			
	10	100.0	0.100	14.63	220006	2200060	2122268	4	14.61 - 14.64
Ciodrin	20	20.0	1.000	16.33	660711	660711			
	20	25.0	0.800	16.34	534660	668325			
	20	33.3	0.601	16.33	414248	689723			
	20	50.0	0.400	16.33	293898	734745			
	20	100.0	0.200	16.33	175159	875795	725860	12	16.32 - 16.35
Bolstar	20	20.0	1.000	17.80	1302934	1302934			
	20	25.0	0.800	17.81	1039455	1299319			
	20	33.3	0.601	17.81	793889	1321825			
	20	50.0	0.400	17.80	518712	1296780			
	20	100.0	0.200	17.80	270815	1354075	1314987	2	17.79 - 17.82
Triphenylphosphate (TPP)	30	20.0	1.500	19.09	723881	482587			
	30	25.0	1.200	19.05	604136	503447			
	30	33.3	0.901	19.05	449793	499270			
	30	50.0	0.600	19.05	317862	529770			
	30	100.0	0.300	19.08	177200	590667	521148	8	19.01 - 19.12
Azinphos-Methyl (Guthion)	40	20.0	2.000	21.45	135070	67535			
	40	25.0	1.600	21.42	67594	42246			
	40	33.3	1.201	21.43	109163	90878			
	40	50.0	0.800	21.42	48756	60945			
	40	100.0	0.400	21.43	29068	72670	66855	26	21.39 - 21.47

19.9.3.3 Organochlorine pesticides

Date: 8/12/98

Column: SPB - 608

Ser. No.: 9677-15B

Organochlorine Pesticides Calibration

OC Cal Mix No.: 20	Stock Conc. (ug/ml)	Dil	Conc. (ug/ml)	RT (min)	IU	RF	AVG RF	%RSD	RT WINDOW
Heptachlor	0.02	20.0	0.001	13.76	224972	224972000			
	0.02	10.0	0.002	13.74	441483	220741500			
	0.02	7.5	0.003	13.74	790564	296461500			
	0.02	5.0	0.004	13.75	992421	248105250			
	0.02	4.0	0.005	13.75	1249988	249997600	248055570	12	13.72 - 13.77
Aldrin	0.02	20.0	0.001	15.09	205607	205607000			
	0.02	10.0	0.002	15.08	359243	179621500			
	0.02	7.5	0.003	15.09	616346	231129750			
	0.02	5.0	0.004	15.10	764149	191037250			
	0.02	4.0	0.005	15.09	923971	184794200	198437940	10	15.07 - 15.11
Heptachlor Epoxide	0.02	20.0	0.001	17.37	209356	209356000			
	0.02	10.0	0.002	17.36	365622	182811000			
	0.02	7.5	0.003	17.36	563581	211342875			
	0.02	5.0	0.004	17.37	698042	174510500			
	0.02	4.0	0.005	17.37	923971	184794200	192562915	9	17.35 - 17.38
DDE	0.02	20.0	0.001	19.74	348284	348284000			
	0.02	10.0	0.002	19.74	557084	278542000			
	0.02	7.5	0.003	19.74	726074	272277750			
	0.02	5.0	0.004	19.75	905832	226458000			
	0.02	4.0	0.005	19.75	1233503	246700600	274452470	17	19.73 - 19.76
Dieldrin	0.02	20.0	0.001	20.04	158668	158668000			
	0.02	10.0	0.002	20.04	315120	157560000			
	0.02	7.5	0.003	20.03	420571	157714125			
	0.02	5.0	0.004	20.04	523423	130855750			
	0.02	4.0	0.005	20.05	705563	141112600	149182095	8	20.02 - 20.06
Endrin	0.02	10.0	0.002	21.36	177125	88562500			
	0.02	5.0	0.004	21.35	348747	87186750			
	0.02	3.3	0.006	21.36	503467	83827256			
	0.02	2.5	0.008	21.37	667674	83459250			
	0.02	2.0	0.010	21.36	847896	84789600	85565071	3	21.34 - 21.38
DDD	0.02	10.0	0.002	21.94	126751	63375500			
	0.02	5.0	0.004	21.94	225111	56277750			
	0.02	3.3	0.006	21.94	294153	48976475			
	0.02	2.5	0.008	21.95	365863	45732875			
	0.02	2.0	0.010	21.96	489567	48956700	52663860	14	21.92 - 21.97
DDT	0.02	10.0	0.002	23.16	83225	41612500			
	0.02	5.0	0.004	23.16	162524	40631000			
	0.02	3.3	0.006	23.16	254104	42308316			
	0.02	2.5	0.008	23.17	322524	40315500			
	0.02	2.0	0.010	23.17	436365	43636500	41700763	3	23.15 - 23.18

19.9.4 Calculation worksheet

Organochlorine Pesticides in Water

EPA Method 8081A

Calculations Worksheet

Description: Water Sample **Date:** 03/02/99
Sample Number: ELAP 98-458 - Spike Solution
Chromatogram No.: OC072498.008
Sample Volume: 1000 ml
Extract Volume: 2 ml **Analyst:** _____
Dilution Factor: 25

Organochlorine Pesticides	R.T. (min)	Extract Concentration (ng/ml)	Extract Concentration (ug/ml) [1]	Spike Conc. (ug/L)	Pesticides Concentration (ug/L) [2]	Recovery %
LINDANE	12.19	0.0000	0.000000	0.000	0.0000	0.00
HEPTACHLOR	13.74	10.8338	0.010834	0.000	0.5417	541690.00
METHYL CHLOROPYRIFOS	14.65	0.0000	0.000000	0.000	0.0000	0.00
ALDRIN	15.08	9.6645	0.009665	0.000	0.4832	483225.00
HEPTACHLOR EPOXIDE	16.65	6.2556	0.006256	0.000	0.3128	312780.00
ENDOSULFAN I	18.81	0.0000	0.000000	0.000	0.0000	0.00
DDE	19.74	32.0423	0.032042	0.000	1.6021	1602115.00
DIELDRIN	20.03	27.1642	0.027164	0.000	1.3582	1358210.00
ENDRIN	21.40	0.9711	0.000971	0.000	0.0486	48555.00
DDD	21.94	96.2221	0.096222	0.000	4.8111	4811105.00
ENDOSLFAN II	22.16	0.0000	0.000000	0.000	0.0000	0.00
DDT	23.15	84.5543	0.084554	0.000	4.2277	4227715.00

[1] $\text{ug/ml} = \frac{\text{ng/ml}}{1000}$

[2] $\text{Pesticide Concentration (ug/L)} = \frac{\text{Extract Concentration (ug/ml) x Extract Volume (ml) x Dilution Factor}}{\text{(Sample Volume (ml)/1000)}}$